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CORRESPONDENCE.

CAPT. HOWGATE'S POLAR COLONY.

BY W. DE FONVIELLE.

Letter to the Members of the Central Committee of the Geographical Society of France.

TRANSLATED BY MISS IDA HOWGATE, WASHINGTON, D. C., FOR THE WESTERN REVIEW.

GENTLEMEN: I have the honor of presenting to you three pamphlets, in the name of Capt. Howgate, assistant to the Signal officer at the Washington Signal office; the first contains the plan for the establishment of the polar colony which this officer intends to establish on the borders of Lady Franklin's Strait, the favorable report which was made on his proposition the 8th of January, 1877, to the United States Congress by Mr. Willis, in the name of the Committee of Naval Affairs; in short, several letters of approval, particularly that of Mr. Daly, President of the Geographical Society of New York, and of Prof. Elias Loomis, the celebrated meteorologist of Yale College.

The second, entitled "Correspondence and action of the scientific and commercial associations in reference to the establishment of a polar colony," comprises the assigned approval of several celebrated and competent persons, among whom it is sufficient to mention Mr. John Ral and Mr. Julius Payer, whose names are intimately connected with the polar regions, where they have acquired

an immortal reputation, and Mr. Joseph Henry, the time-honored director of the Smithsonian Institute.

The third gives an account of the preliminary expedition, of which the command has been intrusted to Capt. Tyson, and all the details which have come to Europe at different times and which needed to be reunited in the same publication. Capt. Howgate has added to it a copy of the instructions given to Mr. Sherman, meteorologist of the expedition, and to Mr. Kumlein, naturalist, especially commissioned with the study of the animals, plants and geology, as well of the countries adjacent to the seat of the polar colony, as of those which will become ports or winter-harbors.

Capt. Howgate informs me in his last letter that he is occupied in preparing a new pamphlet, in which he will enlarge and complete the plans already stated several times. He will naturally make them undergo several important modifications for the purpose of taking into consideration some observations which have been addressed to him, or some studies to which he has devoted himself for more than a year. It is these plans, amended and improved, which he will submit to the United States Congress in its present session—and this formality is perhaps complied with, even at this hour. I beg the Society, then, not to consider the documents which are submitted to it as presenting the decisive expression of Capt. Howgate's plans.

But, at the same time, I will take the liberty of requesting it not to await the arrival of documents which will not change the essential basis of the expedition, and to express its opinion upon the information that I have at my disposal and which my correspondence with Capt. Howgate will permit me, if it is necessary, to complete, at least in different parts.

I cannot help hoping that the favorable opinion expressed by a Society whose influence increases every day, which possesses so many scientific illustrations of all descriptions and which has always shown such solicitude for the solution of polar questions, will exercise a favorable influence on the decisions of the United States Congress. It would be very consoling to think that if the state of our finances does not yet permit us to get up a French expedition, the country of Jules de Blossville, of Francois Belot and of Gustave Lambert will not remain alien to the great attempt which is going to be accomplished and whose execution has already begun. In fact, the *world* knows that Capt. Tyson winters at this moment on the banks of the Cumberland Gulf, at a point whose exact latitude and longitude will be made known at Washington by the first dispatches received on the opening of the ice. It is foreseen that a decision of the Geographical Society would facilitate the vote of Congress. Permit me to respectfully urge it in order that the news may arrive in time to be useful on the other side of the Atlantic.

I will add that the approbation given to Capt. Howgate's plan will not prejudice in any way the plan of the polar international expedition proposed by Count Wilzek and Mr. Charles Weyprecht and which would have been, as you know, discussed by the International Meteorological Congress at Rome in September,

1877, if political events had not obliged the convocation to adjourn till the next year.

The colony at Lady Franklin's Bay must be considered as a beginning of the execution of this universal plan and consequently I am not afraid to say that your adherence to it is obtained. If the American station is found to be placed in a more elevated latitude than the Count Wilzek and Mr. Weyprecht wish, it is only because the expedition of Capt. Nares had the good fortune to dis over, before sailing for England, a rich coal mine, the intelligent working of which will enable the rigors of the severest climate to be endured. These natural treasures belonging to the first occupant, we cannot complain that the compatriots of Capt. Hall insist that the stars and stripes shall float on the shores where we can, so to speak, see the tomb of the great explorer.

The magnetic observations will be carried on in the polar colony with the same regularity and in the same manner as in the large observatories of America or of England. Perhaps use will be made of recording instruments.

The means which will be placed at his disposal allowing him to do it, Capt. Howgate will not neglect a precaution so essential for seizing the precise moment of the disturbances and determining with exactitude the relation connecting the extraordinary movements of the magnetic needle with the apparitions or paroxysms of the aurora borealis. I have not been able to discover, in the long enumeration of precautions recommended by Messrs. Payer and Weyprecht, any precaution that Capt. Howgate has omitted in his programme.

The future station of the colony at Lady Franklin's Bay will therefore furnish observations comparable with those that might be collected later in other analogous establishments as to the questions of magnetism, electricity, rain, wind, etc. The only serious difference will consist in the hour of the individual observations, for the chronometers of the colony will be regulated by Washington time. To be sure, Capt. Howgate attaches a special importance to the readings which correspond to the passage of the sun in the meridian of Washington. Indeed, it is known that this moment has been chosen for the universal observations established by American astronomers. But this particular cannot create any serious difficulty, for it may be inferred that Messrs. Payer and Weyprecht will introduce this important observation in the fine programme which they have made out with such remarkable care and ability.

An important change has been stated by Capt. Howgate in the programme of the preliminary expedition. Instead of being confined to establishing weather-cocks, whose course is always uncertain, and which, moreover, only indicate the movement of the strata near the surface of the earth, Capt. Howgate has given the order to launch in the air small guide balloons whose course will be observed with care and recorded as regularly as the barometer or thermometer measures.

It is to be regretted that notwithstanding all the efforts which have been made in France to spread this method, and the creation of a service of aerial communications by the War Department, it has not been adopted by one of our obser-

vatories, where the directions of winds continue to be studied in the most imperfect manner—as if air-balloons had not been invented.

I will take the liberty to remark on this point, that small guide balloons, being constructed scientifically, can be carried by the winds to immense distances. The history of balloons furnishes several examples of it, and that of the siege of Paris would suffice to establish victoriously that free air balloons launched from the Cumberland coast or from the polar colony would have strong chances of reaching even civilized countries, where a few of them could be collected. It is not necessary to enter into long explanations to show that this manner of proceeding may be considered as very superior to the ancient practice of intrusting closed bottles to the waves of the ocean. Yet it is unnecessary to suppose that in the actual state of aërostatic knowledge it would be possible to start from the polar colony air balloons equipped with the view of reaching the polar regions. The plan proposed by a captain in the English Navy has no connection with the projects of Capt. Howgate.

While proclaiming the necessity of finding some means of utilizing atmospheric communication on the borders of the eternally frozen sea, where the course towards the pole will always be so uncertain and slow, the cautious American officer has understood well that it is necessary to proceed in a methodical and sure manner in a question so new. He has taken great care not to fall into the traps of those quacks who prepare inevitable shipwrecks in presenting to the public or even to the government projects of which we hear so often and which bear the imprint of rashness and of ignorance.

The founder of the polar colony would have wished to organize some free and captive ascents on the border of the polar sea, in order to profit by favorable aërial currents to advance towards the north and return towards the south, much the same as the French aëronauts have succeeded in doing on the borders of the Mediterranean or of the ocean.

But after having examined the means which the expedition had at its disposal, it has been found that a gasometer of only eight feet in height and eight feet in diameter, could be constructed in the polar colony, which would be unable, consequently, to render any service in the inflation of air balloons of from two to three thousand metres cubic, the smallest that can be adopted for so difficult a service. Whatever may be the means used and the process employed for preparing pure carbonated hydrogen gas, a magazine of gas of so feeble a capacity would be no help even in our climates. They would not be satisfactory even for traveling ascensions.

What sincere aëronaut would risk preparing his gas in proportion as it should be introduced into the balloon, unless he resigned himself to prepare it by the action of acid on iron in the apparatus for continuous production by Mr. Henry Giffard. But if it were done in this manner, it would be necessary to carry to the polar regions a full cargo of sulphuric acid and iron.

If we hesitated at this extreme expedient, use could not be made of the air balloon without having resolved another problem not less difficult.

It would be necessary to keep the balloon inflated until the moment when the atmospheric circumstances would permit of trying the ascension with reasonable chances of returning towards the south after having been carried more or less towards the north. During probably a very long time, it would remain exposed to winds of extreme violence.

But the necessity of preserving a balloon in such circumstances is precisely the greatest of all difficulties which will have to be surmounted in order to use air balloons in the polar regions, as it is only too easy to understand.

For the air balloon which could keep up in the air whose envelope would have a stability sufficient to resist the most violent wind, could float during the entire summer above the polar regions, touch the earth in a multitude of different points, and terminate its voyage near a place of safety. Such a programme would cease to be beyond human power, especially if these countries, where modern civilization struggles with such gigantic difficulties, were marked out by numerous scientific colonies which the spirit of progress will not delay to create there.

I believe, then, it is necessary to encourage and assist Capt. Howgate in all the researches which have for their object the study of the distribution of aërial currents at the north pole, not only with the view of enlarging our meteorological knowledge, but also with the intention of using them in future aëronautic expeditions.

Indeed, the discovery of circumstances exceptionably favorable, such as the existence of regular land and sea breezes would be, might lead to accumulating even in the colony at Lady Franklin's Bay, some means of inflation which would not have been thought of at the beginning of so important a foundation.

While stating with regret, that for the moment we cannot do more, it seems to me that we ought to congratulate Capt. Howgate for having introduced air balloons, even under the form of simple exploring balloons, in a region where sooner or later they will permit us to approach the solution of the most redoubtable mysteries.

I hope, for my part, that by the help of information collected by Capt. Howgate, we shall be able at the close of the Universal Exposition to propose to the government the adoption of a reasonable plan of aërostatic operations, taking as a basis either the polar colony of Capt. Howgate or those whose foundation will have been decided, according to all probability, at this date.

In response to this eloquent appeal of M. de Fonvielle, the Geographical Society addressed the following communication to Capt. Howgate as evidence of its interest in the subject of Arctic Exploration.

GEOGRAPHICAL SOCIETY OF FRANCE,
No. 3 CHRISTINE ST., PARIS, Jan. 31, 1878.

CAPT. H. W. HOWGATE, *U. S. Army, Washington, D. C.:*

The Geographical society of Paris watches with the liveliest interest the efforts which have been made in the United States to organize a Scientific Colony in the Polar regions of the north, and it will commend every resolution of Congress favorable to the project in which you have taken the initiative, and which, thanks to

the aid you have already procured from intelligent compatriots, is already in process of execution.

The Society thinks that your idea of establishing a polar colony cannot fail to produce results emimently useful to science, and that, while permitting the indicated observations to be made, it will hasten the geographical conquest of the polar regions.

The Society follows with its most sympathizing wishes Captain Tyson, in the preliminary expedition with which you have charged him, and its good wishes will likewise be yours, the day when at the head of the expedition, you have profited from the results obtained by the commander of the Florence and his brave fellow voyagers.

In thanking you for the active part you have taken in the preparation of this polar campaign, we pray you, sir, to be pleased to receive the expression of our most distinguished consideration.

C. DE QUATREFAGES,
President of the Central Commission, Member of Institute.

C. MANNOIR,
General Secretary.

DE LA RONCIÈRE-LE-NOURY,
President of the Society, Vice-Admiral and Senator.

SCIENCE LETTER.

PARIS, FRANCE, May 11, 1878.

According to La Rochefoucauld, jealousy betrays more self-love than love; only small minds are vain, and from vanity to jealousy is but a step. Is there an abyss between jealousy and madness? Dr. Moreau asserts, no; for him, jealousy is a disposition wishing to be the sole possessor of an object. Pushed to excess, it can become a monomania, and thus lead to redoubtable and unconscionable acts. He classes the jealous among the class of incomprehensible-patients; as the case of a husband, persecuting his wife with unfounded suspicions, or a mother, envying the beauty, gracefulness, and success of her daughter.

Of all the uses to which needles and pins have been applied, that of converting them into something like an article of consumption, is the strangest. Yet there are people who devour them passionately, and by dozens, as if they were oysters. Some prefer needles, others have a marked taste for pins—those especially of the small, white pattern, with round heads. Not less extraordinary is the facility with which these foreign bodies circulate through the tissues, and across organs more or less long. At the end of several months, or years, the needles and pins arrive beneath the skin, from which they are extracted as a needle sunk to the eye in a pin cushion. Not only do inmates of asylums exhibit a partiality for swal owing these substances, but persons sound in body and mind, also. Silvy quotes the case of a woman, in robust health, who had a passion for swallowing pins and needles, 1,500 of which were found in all her organs after death. Villars relates the instance of a woman aged 26, who, in the space of

seven months, rendered by her skin, more than 200 needles and pins. The latter "came to the surface" more rapidly than the former, and the needles are generally rusty. The head, the arms, the abdomen, the armpits, and the legs as far as the knees, are the parts where these substances "exude." Dr. Otto has found them in veritable nests below the skin, forming bumps, containing 100 pins, etc. The latter are often extracted at the rate of 20 to 60 per day, and never accompanied by bleeding; occasionly pain precedes their arrival. When the needles in gliding through the muscular tissue, encounter a hard obstacle or a soft organ, some nervous accidents may ensue, terminating fatally; gastric derangements are mostly to be apprehended. There is a case recorded of an individual who swallowed a pin, and after a sojourn of 42 years, it was expelled by the bladder.

A central administration supplies the Paris hospitals with bread, beef, &c. The bread is very white, and pleasing to the eye, but devoid of taste, and positively insipid after 24 hours. Dr. Blachez, invited to suggest ameliorations in the dietary of the hospitals, denounces the universal plan of soup and boiled beef. He agrees with Brillat-Savarin, that "boiled beef, is only meat less its juice," and that the resulting soup or broth, stimulates the taste, but does not nourish the body. It is an error to view broth, according to the Dr., as either a quintessence or an extract; the *musculine*, or alimentary portion of meat, is profoundly altered by ebullition, according to Messrs. Robin and Verdeil. There are patients who require beef-tea as a drink. Dr. Blanchez would not have the residual meat consumed in the hospital, but sold to low-class eating houses, that could mix it with vegetables and fatty matter, to suit robust appetites. For hospital diet then, roast, not boiled, should be the form in which meat ought to be served to the sick.

Maize is too important a matter in alimentation not to be carefully studied under every aspect. M. Fua, of Padua, a celebrated botanist, is a warm advocate of this grain, asserting that it is as rich as wheat in muscle-forming elements, besides containing four times more fatty matter. In a word, maize contains in itself all the substances necessary for repairing organic losses, without the aid of complementary matters. Its sedative-producing effects are so notorious that the French authorities are experimenting with maize bread, for the inmates of prisons and hospitals. It is remarked, that the inhabitants on one bank of the Po, are proverbial for the tranquillity of their character—the consequence of living on maize, while their neighbors on the opposite bank, are notorious for their quarrelsomeness. All parties agree that maize has one draw-back, it produces a disease named by the Spaniards *pellagre*, a cutaneous eruption, followed by intestinal ulcerations, and nervous disorders. This malady according to Dr. Gubler, is due to a fungus, a kind of ergot, of a green color, possessing venomous properties, and peculiar to *damaged* maize, and Turkish wheat, especially if harvested during damp weather. In the southern regions of France, *pellagre* was

at one time very prevalent, but by kiln-drying the grain, the mushroom was destroyed, and with it the source of the disease.

The influence of light upon plants and animals, has, up to the present, only been summarily examined by science; hence, the greater reason for probing this delicate and difficult subject. The chief impediment to the study of the matter arises from the complex nature of light itself. What are the active, what the inert rays, for the properties of light change following the nature of the rays? Professor Paul Bert has devoted lately much attention to the problem. In the last century, Priestly discovered that the green parts of plants, exposed to solar light, decomposed the carbonic acid of the air, appropriating the carbon, and liberating the oxygen. The green parts of plants are thus chemical re-agents, and at the same time, reservoirs of carbon. The longer the duration of sunlight, the more rapid is vegetation. Wheat in our latitude requires from 130 to 140 days to ripen, while in Norway 90 to 100 suffice. In the north, the influence of the sun is longer in its daily duration, though its rays are at the same time more oblique.

M Bert has studied the action of light on the sensitive plant. He denies, in opposition to the popular belief, that the leaves close on the approach of evening, similarly as if they had been touched by the hand. On the contrary he finds that from nine in the evening after drooping, they re-expand, and attain the maximum of rigidity at two in the morning. This rising and falling, is the ordinary process of their daily life. The so-called sensitiveness of plants, is but the external physical manisfestations of the influences of light. Bear in mind the plant is a complex laboratory, forcing carbon in its green parts, burning it in the non-green tissues. M. Bert placed plants in lanterns of various colored glass; those under the influence of green panes, drooped in the course of a few days as completely as if plunged into absolute obscurity. The explanation is simple: the green rays are useless, and hence equal to none at all. In some weeks, all plants without exception thus dealt with, died. M. Zimiriareff's experiments prove that the reducing power of the green matter of plants is proportionate to the quantity of red rays absorbed, and Paul Bert demonstrates, that green glass precisely intercepts these colored rays, and that plants exist more or less healthily in blue and violet rays. For horticulturists, the practical conclusion is, avoid green glass. In the Botanical Gardens of this city, the Vanilla, in a hot-house covered with green glass, was sickly and never flowered; the house was battered by a shell during the siege; the building was repaired with white glass, and since then, the Vanilla is robust, and flowers. Similar observations apply to the fernery. In the animal world, phenomena of a directly opposite nature are to be noticed, and of a more complex character; here the light acts on the skin and the movements of the body, either directly, or through the visual organs. M. Pouchet has pointed out the changes in color that certain animals experience, following the medium in which they live. Thus young turbots reposing on white sand, take an ashy tint, but become brown when resting on a black bottom; when the fish is deprived of its eyes the skin exhibits no change of color; the phenomenon is thus nervous

or optical. The chameleon's color does not alter following the color of the position where it rests; but when acted upon by the sun's rays, it assumes a tone more or less deep, passing from an apple to a bottle green, and brown. M. Bert placed a piece of paper with a cut design, on the back of a sleeping chameleon; on bringing a lamp near the animal, the skin gradually became brown, and on removing the paper, a well-defined design appeared, Here light acted directly, and without any nervous intervention. However, if an eye of the chameleon be extracted, the corresponding side of the animal becomes insensible to the influence of light. M. Bert concludes, that light must affect the circulation in the transparent layers of our skin.

This may explain why some doctors recommend weakly children to be kept well in the light, and to allow the latter to enter freely wherever possible in sick rooms. Possibly the good effects of not covering the neck, arms and legs of children may be attributed also to the same cause. A sun-stroke, according to Dr. Bouchard, is the effect of the direct action of light upon the skin, produced by the blue and violet rays. The heat-producing rays have no part in the accident, as workmen exposed to intense heats do not feel their fatal effect. M. Bert has experimented on a variety of animals, from the microscopic daphnia of ponds ranging up to man; none fled the light; all sought it, and the lowest like the highest, absorbed the same rays. There was a difference respecting the intensity of color, some being more partial to one ray, than to another. The daphnia had a weakness for yellow; violet was in less request; spiders felt happier in blue than in red rays—resembling thus people suffering from Daltonism. No two persons, while absorbing the same light, are sensible to the same shades or tones; thus indicating that the retina of the eye has a selective power.

When in the neighborhood of telegraph posts and wires, we hear a buzzing or singing noise. M. du Moneel denies that this is due to "earth currents," but to the action of heat on the wires; the buzz is loudest during serene weather, and the currents flow in different directions, following the day or night. Professor Gressier announces that the telephone, whose wires run over the same poles, reproduces the same sounds, in the evening especially, and so intensely, as to create the belief that the telephone plate is going to break. He does not think the matter is connected with the simple transmission of sound, but of veritable currents originating in the upper regions of the atmosphere, relatively to the position of the observer.

M. Salathé gives the results of his experiments as to the influence on the brain from the point of altitude of animals. Many weak persons suffer extremely, when passing from a horizontal, to a vertical altitude. M. Salathé placed some rabbits head upwards; in three quarters of an hour death invariably ensued; the movements of the heart and lungs diminished; the pressure in the vessels of the superior parts of the body became less, while increasing at the opposite extremities. When replaced in the horizontal position, the rabbit speedily recov

ered itself. But what will surprise many is the fact, that when an animal was placed head downwards, it supported that position by living for several hours—the respiratory movement alone being accelerated. This may explain how acrobats can "stand on their heads" for so long a time with impunity.

In the south-west of France there are extensive beds of phosphorites worked in the interests of agriculture. M. Filhol, a very rising geologist, has examined these mineral phosphates, formed by clefts in the soil, which subsequently became filled with water holding the phosphorite in solution. The earthy layers surrounding the nodules are full of well preserved organic remains, such as the lemur, analogous to the galago of Senegal; the reptiles correspond with species at present to be found in Africa, and the mollusks indicate a climate warm and humid, similar to that of Indo-China.

Water is composed of two gases—hydrogen, a combustible, and oxygen, the supporter of combustion. Science has been for years engaged endeavoring to decompose water, and turn its constituent gases to account as a source of cheap fuel. The processes have hitherto been costly, tedious, and difficult, by dissolving the fluids, slightly acidulated, by means of an electric current, or passing steam over incandescent coke. A new plan is announced: Forcing a volume of steam through a kind of oven heated red hot, and later, allowing it to escape over an incandescent plate where the oxygen is liberated and the hydrogen collected and stored. After the telephone and phonograph, science has no occasion to despair.

M. LeBlanc shows that when a person commits suicide by means of charcoal fumes, it is not the carbonic acid that suffocates, but the oxide of carbon gas, which, seizing a second moiety of oxygen from the globules of the blood, deprives the latter of its normal supply and asphyxia ensues. Hence the importance of fresh air for crowded rooms, and the necessity to avoid stoves, *braseros*, and smoking saloons, where combustion and its namesake, respiration, being incomplete, the oxide of carbon draws its deficient oxygen at the expense of our circulation, that is to say, our health and our life. F. C.

EDITORIAL CORRESPONDENCE.

SPRINGFIELD, MO., May 24, 1878.

WESTERN REVIEW:—The editorial excursion to this place has been so far a perfect success. The weather has been pleasant, and the ride over and through the somewhat mythical Ozark mountains has been exhilarating in the extreme. Our reception by the hospitable people of Springfield was courtesy itself, and everything has been done by the editorial fraternity, the ladies and the whole populace to render our stay agreeable and profitable; and we have enjoyed it.

The county of Greene lies upon the summit of the Ozark mountains, which here attain an elevation of 1,500 feet above the Mississippi river at St. Louis. It

is an eminently agricultural region, though lead and iron are believed to exist in paying quantities. The commercial interests of Springfield are more fully developed than those of almost any other city in State, there being some twelve or fifteen flouring mills, nearly as many saw mills, with factories of all kinds, including a cotton mill in successful operation. Being the center of a very large agricultural district not very fully provided with railroads, it is the headquarters of a very heavy inland trade, extending throughout Southwestern Missouri and Arkansas.

The most interesting features of the country to the naturalist are the numerous springs of mineral and other waters and the caves, found in several directions near the city. About seven miles northwest is Knox cave, which has been explored more than a mile, and varies from twenty to seventy feet in width, from six to thirty feet in height, and is from seventy-five to one hundred feet below the surface of the ground. For some distance from the entrance it passes through the limestone rock and is hung with the most beautiful stalactitic formations constantly dripping with water.

Fisher's cave, six miles southeast of Springfield, is similar in dimensions, and has a fine brook flowing out of it. There are several large rooms in it connected together, some of which have not yet been fully explored. It is a favorite resort for pleasure parties, as is also the natural bridge which is about five miles south of Springfield in the same direction. Near Cave spring there is another natural bridge, through which pours a beautifully clear stream of water.

Near Ash Grove, about twenty miles west of Springfield, on the Springfield & Kansas City railroad is a most magnificent and colossal cavern, with "rooms, corridors, halls and gangways, full of beauty, grandeur and sublimity. One opening is a large circular hole about forty feet deep, down which the descent is very steep. Another opening leads in from the river, and is about eighty feet broad with a finely arched roof, the floor being composed of large flat rocks. It is the most beautiful place for a picnic in the State, and will accommodate five hundred ladies and gentlemen. The water from the spring near town runs through the hill into the river, and after a heavy rain huge floods rush through the cave, leaving in their wake the debris of wrecked trees and moving mountains. About a mile below this, on the river, is another cave, much larger and grander than this, which is yet to be explored. And there are still others in the vicinity; in fact the hills are full of these grand palaces of nature's own fashioning, which must make the Grove a fashionable resort for future excursions."

Near Ebenezer, ten miles north of Springfield, are some interesting archæological relics, among them a large mound which has often been visited by tourists but never fully explored.

Drury College, which is named for Sam'l F. Drury, of Olivet, Mich., is a flourishing institution, and a decided acquisition to the city, both in point of educational facilities and on account of its handsome, substantial appearance. The National cemetery in which lie the remains of 1,500 Union soldiers, and which is handsomely ornamented with walks, flowers, etc.; also with huge cannon set on end, and with a very beautiful marble monument costing $6,000, the bequest of

Dr. Thos. Bailey, who died several years since, is also a source of pride to the citizens of Springfield, and an object of interest to visitors.

In the adjoining counties are many interesting natural curiosities, all within comparatively easy access from Springfield, such as the "Sunken Lake," of Webster county, about fifteen miles south of Marshfield. "This lake is on the summit of a hill and locked in by a wall of limestone about an hundred feet in height or, more properly, depth, for the top of the hill seems hollowed out and lined with this limestone basin whose walls stand perpendicularly, inclosing the lake solidly, except on the west side, where a gap occurs that one can descend with the aid of two 20 foot ladders. The crevices of the rocks surrounding the lake are filled with a substance resembling sperm, that burns like a candle, and in the basin are some old cedar logs, though no cedar grows nearer than eighty miles to this wierd region, whose name of Devil's Den suggests sorcery to the superstitious."

In Polk county, near the village of Orleans, and ten miles southwest of Bolivar, are the Wallula Chalybeate Springs, noted for their medicinal properties. They issue from the rock high up among the hills of the Sac River, into which they pour their waters. The surrounding country is exceedingly picturesque, and the springs are much visited by invalids and tourists.

In Christian county lead mining is carried on quite extensively while, iron and zinc ores and tripoli have been found in abundance.

In Dallas county coal has been discovered extensively, also iron and lead, with indications of copper. In several portions of the county traces of ancient diggings are to be seen, but what these miners sought, and what they found, who they were, whence they came, whither they went, and when and how long they delved there are problems that no one has yet worked out. Near Greenfield are some Chalybeate springs, believed to contain valuable medicinal qualities.

In Dallas county lead is abundant, while iron, coal and building stone have been found different localities.

All of these attractions and sources of wealth are within about 25 miles of Springfield, and are more or less directly tributary to and dependent upon her for an outlet and a market. By extending proper facilities in the way of roads and purchasing capital she may easily remain as she is now, the gem of the Ozarks and the metropolis of the Southwest. C.

The commercial value of some forms of artificial ice is seriously lessened by its opacity or cloudiness, which gives rise to the impression of its impurity. This opacity is generally the result of the enclosure of innumerable minute air bubbles at the time of freezing. A simple method of preventing this defect consists in passing purposely a current of air through the water about the time of congelation, which in its ascent carries with it all the minute bubbles, and leaves the ice perfectly transparent.

MILITARY EDUCATION.

NATIONAL DEFENSE AND MILITARY EDUCATION.

BY CAPT. J. M. TROWBRIDGE, C. E., KANSAS CITY, MO.

It is proposed to occupy the attention of the Academy for a few minutes this evening with some thoughts on the subject of National Defense and Military Education. The subject is perhaps not without interest at the present moment, when several of the most enlightened nations of the world appear to be about to engage in a struggle for the fruits of a conquest achieved by one.

The principal interest of the subject to us lies in the question whether we are safe from outward assault. Americans are apt to put away from thought and sight the possibility that *they* are in any way liable to be brought into collision with any of the greater powers of the world. That we may yet be questioned at the sword's point, for the reason of our national existence, seems never to have entered the American mind as among human possibilities. We feel that our strength of numbers and resource are so vast that none but the strongest can assail us with any hope of advantage, and that those strong enough are so distant as to be prevented by the magnitude of the preparation necessary. Besides, having contiguity of territory with but one of the great powers, with whom happily all questions of boundary as well as all other known differences have been amicably adjusted, we feel that none can have motive for attacking us. Unfortunately for the peace of the world, where interest dictates motives are easily found, and it is only in perfect preparation that perfect immunity from aggression can be obtained. Under such circumstances neglect of due precaution is madness, and our blind, unreasoning assumption of security may yet work our ruin, if it causes us to continue to neglect preparation, when to be unprepared is to invite attack. It is not to what other nations will forbear that we must look for security. Safety lies only in ability to confront all possibilities any adversary can present. Fortunately for us the requirements to accomplish this much for ourselves are light, compared to those borne by the people of Europe. They should therefore be the more cheerfully sustained. If in accomplishing this, other great ends of national interest can be promoted, as we shall presently try to show, it will indeed be doubly criminal to neglect them.

A generation ago, the assumption that our strength and distance from any power able to cope with us afforded us sufficient protection was perhaps just. Then neither the men, the material or the transportation, for the purpose, could have been gathered by any European power except with occupation of so long a period of time and display of such active effort as would be certain both to challenge our attention and to afford us opportunity to prepare for its reception. Since then all the conditions of the problem have been changed. Then Europe

was forty days distant from our shores, now it is but ten. Then sea-going transportation consisted nearly altogether of sail vessels of comparatively small capacity, and to collect the number adequate to accommodate an army of invasion, strong enough to effect lodgemen tonour shores and protect itself during the three months or more required for reinforcements, would have been extremely difficult if not altogether impracticable. Now the English steam troop-transports actually carry one thousand men and officers with their entire field camp and garrison equipment and stores. It would require but one hundred such vessels to enable the embarkation of an army of one hundred thousand men. Probably one hundred such vessels are within the harbors of either of the great European powers any day.

During the same period of time, army organization has been brought to an amazing degree of perfection. A generation ago, the railway was in its infancy and the telegraph but just born. Then, to gather an army of one hundred thousand men occupied a period of time, which, rated at its speediest, had still to be measured by the slow paces of the postal rider, and the courier, distributing the order, and of the still slower movement of the diligence conveying soldiers to rendezvous, or regiments to frontiers. To-day all this time is comparatively annihilated. The telegraph reaches the remotest rendezvous as speedily as the nearest, and the conscript in the field, in the remotest part of the country, can be put in motion towards the rendezvous as soon as he at the doors of the capitol. It is asserted, with substantial reasons for belief, that were the German Emperor to issue an order to-day for the remotest regiment of the "first ban" or reserve army to report in Bremen in three days, that the third day would show the regiment at its post with full ranks, fully armed, equipped and supplied for immediate service at home or abroad. Of course, movement of the standing army would be still more prompt, but the reserve is here instanced because it shows to what perfection preparation may be carried for the collection of troops where no standing army is maintained.

The work actually accomplished by Germany during the first ten days of the Franco-German war of 1870 seemed magical, and leaves no doubt of her ability, if it became her purpose, to place an invading army of one hundred thousand disciplined troops on board transports in her harbors, in ten days, completely armed and supplied for service near or far. It is to be remembered that France commenced that war, yet, so superior was the German organization, that with all the advantages which the possession of secret hostile intent gave France, still Germany was first in force on the frontier, and at all times the superior. Indeed, whoever supposes that the improvements in military arts of the last thirty years have been confined to arms alone would be grossly deceived. While these by themselves have been sufficient to augment the destructive power of an army ten-fold and to change the whole system of tactics and fortification, they have yet scarcely kept pace with the rapid improvement in logistico, which is that branch of military science embracing all details pertaining to movement and supply of armies. At the present time everything is laid under contribution to perfect mil-

itary arts and materials. Every improvement in the arts and trades, and every invention, as soon as announced, is now sharply scanned by keen, discerning minds, to ascertain if it presents any single feature which can be applied with advantage to military purposes. It is but a few weeks since an American invented the telephone, and a knowledge of its wonderful capacities has scarcely yet become common property; yet it is already announced as an adopted instrument of the German military field service.

Reference is made to the Germans only, because, at the present time, they have carried military preparations to higher perfection than any other; but the other European powers are close and earnest students of her methods, and will never allow themselves to fall much behind in the rivalry for military supremacy. What Germany is in this respect to-day, a very few years will see all the other principal powers closely assimilating.

Military power is a product of three factors—numbers, preparation, resources. The want of either is fatal to effectiveness. Of the three, insufficiency of numbers is least injurious. This is contrary to common, current notion, but it is nevertheless true. The greater an undisciplined, ill-provided force, the more difficult to control, the more difficult to move, the more difficult to supply and the more easily made prey to panic. It is not the numbers subject to military duty, but the force ready, that constitutes a nation's strength. Hence, of the three factors, preparation is the most important. It is in preparation that our nation is weak. Preparation includes organization, discipline, mobility, supply. These give ability to smaller numbers to be always strongest at the point attacked, and thus gain victories. When exercising on the field of battle it is tactics, when practiced on the larger scale over a broad scope of country covered by distinct bodies of troops, it is strategy.

With the improvements in arms and the objects sought to be thereby obtained, viz., increased destructive power of the soldier, all are well acquainted; but the improvement in logistics, the supply and movement of armies, are not so well understood. Improvements in this branch seem to have been concentrated upon one paramount object, that of accumulating power for instantaneous, effective striking, to be able to crush a foe before he can prepare defense. It is the progress and improvements in these respects that have scattered the problem of invasion of the United States from Europe. The value of such power will be seen when we consider what is the object of human warfare. Wars are waged to compel the doing by one nation of that which another desires, usually claimed by the other to be right and just. The objects for which it is waged are unattained so long as power of resistance remains. Power of resistance consists in ability to collect men and munitions. Whenever a people are no longer able to gather men and material to make headway against their invaders they are subjugated. This is the reason why so small a force, comparatively, as an invading army, are able to subjugate the vast population of a nation. The American army of occupation in Mexico comprised less than one hundred thousand men, yet it held in subjugation a nation of eight millions. The German army in France comprised

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only about eight hundred thousand men, yet were able to hold the highly military French nation of forty millions in complete subjugation. Neither of these peoples could accumulate at any point the men and material for resistance, before a stronger force could reach their depot, destroy the stores and disperse the force. In such circumstances a people have no alternative but submission.

Perhaps it will be thought by some that our navy should protect us from invasion by sea; but had we a navy respectable in tonnage and armament it would prove no reliance to prevent invasion. Scott says: "It is not necessary to combat an idea which all history controverts, that a large naval force will ever be able, by cruising in front of our extended coast, to prevent a hostile expedition from landing on our shores." The subject was long since thoroughly investigated and ably discussed in an exhaustive report to Congress by a board of American officers, whose conclusion concedes the impracticability of covering even a small extent of coast by cruising in front of it. Allison, the historian, finds in the facts of history "considerations calculated to weaken overwhelming confidence in naval superiority, and to demonstrate that the only base on which certain reliance can be placed even by an insular power, is a *well disciplined army* and the patriotism of its citizens. But patriotism avails little without discipline. Discipline is the soul of an army. Without it an assemblage of men in battle can never be more than a panic-stricken mob. Instances are not wanting in our own history to sustain this. Princeton, Cow Pens and Guilford Court House, during the Revolutionary war, and Bull Run, in the Civil war, amply sustain the declaration of Washington, that undisciplined forces are nothing more than a "*destructive, expensive, disorderly mob.*" The history of all modern warfare proves that it is preparation in peace gives victory in war. If the American people suppose that the facilities which our railways afford to concentrate large masses of undisciplined men in short periods of time, will supply the want of military training, they will find their answer in the quotations cited.

Meantime, while this progress is made by others, what are we doing? How are we preparing for an event which may be precipitated upon us at any moment? By reducing our diminutive army; by cutting down our navy; by doling the appropriations for our training schools at West Point and Annapolis; and by harassing both army and navy with neglect to pay and with constant threats of early extinguishment. A few years more of this kind of encouragement to our military profession, and of corresponding progress and improvement, among the military powers of Europe would leave us absolutely defenceless in case of a rupture with any of them. It was this disposition noticed by De Tocqueville, called forth the allusion to our danger in these mild reproofs: "That (in the United States) "the military career was little honored and badly followed in time of peace; that "the public disfavor bows down all military spirit; and that if such a people "were to undertake war, after a long peace, they would run much greater risk "than any other people of being beaten."

The course of Congress towards the army since the close of the civil war seems to be prompted by conviction either that a standing army is dangerous to

our liberties, or that it is an unnecessary burden. Possibly each idea has its several supporters. That an army of 20,000 can be very dangerous to the liberties of 40,000,000 needs only to be stated to show its absurdity. As regards usefulness, its honorable record may be triumphantly pointed to as sufficient answer.

Whatever the cause, it is certain that an unfriendly feeling towards our little army and its nursery, the Academy, is prevalent in Congress, and as the disposition of Congress is supposed to be a reflex of the popular opinion, it may be worth while to inquire somewhat briefly into its possible causes.

The feeling referred to has manifested itself mainly since the close of the civil war. That event left the army necessarily sectionalized in its *personnel.* Nearly all the officers of seceded States, obeying what they believed to be a paramount obligation of fealty to their native States, had gone into the Confederate army. Since the close of the war the return to the old condition has necessarily been slow. The Academy graduates from the Southern States are still low of rank, and the army is yet substantially a Northern army. With this constitution, it has been employed in the seceded States, to whom its sectional constitution renders it alien, as a garrison, to hold the territory; to conserve the peace, and to protect an enfranchised, servile people. In the Northern States its more recent employment has been in the suppression of the organized class rebellions, known as labor strikes; and in both North and South, it is constantly in use as a *posse* to suppress illicit distilling, an art but recently free to all. These offices are not such as admit of gaining any particular honor, nor should our little army be employed in them; in other countries they are relegated to the civil functionaries, supported, if need be, by a semi-military police.

Again, our army forms a distinct class. Its officers are the only servants of the people over whom the people have no control. Election day has no possible eventualities for them. They are under none of the necessities which originate demagogues, and have no occasion to seek popularity by arts which demean and deeds which degrade. They are apparently separated from the mass. They seem not to be of the people, nor as many would argue, for the people. While this seeming is far from the reality, it is none the less likely to continue until the people can be made to feel this supposed disposition is reversed, and the army of them, and with them, so that under all circumstances they can rely upon its sympathies. This forbids that it ever be allowed to become alien, either in rank or in file, or in any degree sectional. It must be among the people, of the people, and with the people, sharing in their aspirations, unswayed by their passions. Such an army can only be recruited from the youth of our own citizens, and from those of the better class if they can possibly be induced to enter. Inducements should be held out for these which will draw them into the ranks, and thus effectually Americanize the standing army which, fortunately for us, need never be a large one.

Our strength and our distance from Europe, whence only can danger menace us, enables us to satisfy the requirements of the problem of national defense with but little of the sacrifice which is the price of national existence there. The

American people would never submit in time of peace to the burdens of an establishment adequate to the requirements of a state of war. Our main reliance in any war must be, as in the past, upon citizen soldiery, but they must be better prepared than now. We are liable to drift into war at any time,—not so liable as are the powers of Europe,—but still liable, and that liability if we are to be an independent people, requires that we maintain so much of a military establishment as will keep the military arts and knowledge well known, and as will also enable us to put our volunteers promptly into the field, as far advanced in discipline as may be possible, fitly and skillfully officered, and thoroughly armed, equipped and supplied.

France, England and Germany are but ten days from us. Their forces are ready and are experienced. How would volunteers unused to drill or to discipline, poorly armed and above all, unskillfully officered, confront the veterans of Europe. It took McClellan one year "all quiet on the Potomac" to make an army of McDowell's mob. Fortunately the Confederates were in similar plight. Had either army possessed a veteran corps of twenty-five thousand men at Bull Run, the result had been different. With such a corps it is safe to say the Confederates would in ten days have held Washington, Baltimore, Philadelphia and perhaps New York, and compelled severance of the Union; or had such force been on the other side, Richmond and the Confederacy would have fallen in like period.

The situation in which our hundredth anniversary found the American people in respect of national defense was this: A nation of forty millions, with a seacoast of two thousand miles, everywhere accessible, substantially without a standing army and practically without a navy, but ten days distant from three of the strongest powers of earth, each "armed to the teeth" with the most improved arms and with organization and equipment perfected to the last degree; each able at twenty days notice to land one hundred thousand veterans on our shores, whom they could reinforce in twenty-five days more. These are the simple facts concisely stated. Now if we are to be an independent people, not living upon the forbearance of other nations, but able to resent insult or repel aggression, we must be able to meet the possibilities which these racts envelop. What is now our reliance? An army of volunteers to be raised in an emergency, and to be collected, organized and drilled by officers of a regular army, numbering at utmost perhaps one thousand disposable officers. How much time might our accommodating adversaries consistently be expected to wait for us to accomplish the work which took McClellan a year? That McClellan consumed a year was only because he had not enough trained officers to accomplish it earlier. *He had his officers to make as well as his soldiers.* Had there been at his command among the people any available supply of disciplined, educated officers, his work would have been done in one-fourth, or perhaps one-eighth of the year he occupied. Such a supply of disciplined, educated officers would require to be of sufficient magnitude to furnish complete official organization for an army of at least one hundred thousand men. This requirement would demand instantly the services of about five

thousand officers to fill the line and field offices and to put into action the equally important administrative duties pertaining to subsistence, transportation and equipment. Such a reserve of officers would leave our little regular army intact for immediate use, and it would then be able to fill its intended purpose of a nucleus on which to form the volunteer forces. Such a reserve, too, would serve to keep alive among the people the military spirit, which however deplored by visionary philanthropists, still is necessary for national defence and for national respect—unless indeed we should wish to become a nation like the Chinese. It was the wise Francis Lord Bacon who said "the principal point of greatness in any state "is to have a race of military men," and "that it consisteth also in the value and "military disposition of the people it heedeth." What was true then is equally true now, and so will remain till human nature changes.

Probably such a reserve of officers, with the partially drilled citizen soldiery now organized by the several states as National guards, will constitute the nearest approach the American people will ever tolerate to a standing army. Were the officers commanding these National Guards educated and disciplined, the Guards could not fail to be the better soldiers for such instruction, and the task of creating an army on the occurrence of hostilities would be already well advanced. A National Guard so originated and officered would be able to hold their own, in chosen positions, against perhaps equal numbers of veterans, and if the supply of officers were adequate, the aggregate of the National Guards of States, would furnish sufficient force ready at all times to take the field on the first call. An effort will be made to show how such a reserve of officers can be created without sensible increase of the annual national expense account, and without aggravating or intensifying the existing opposition to a standing army, or the army training school. Preparation to this extent is a defence which puts a different aspect upon the problem of attack upon the U. S., as viewed from abroad. It would not prevent a landing on our shores, but it would restrict offensive operations by a force so landed.

Whoever has looked upon the Corps of Cadets at West Point considerately, has perhaps asked himself or others the question: "What would they do were a foreign foe to assail them here?" No second thought gives hesitancy to the reply "they would fight desperately and defend their post to the last." No more effective garrison could possibly be gathered at that, or any post, than that constituted by the Corps of Cadets at West Point. If this be true of West Point, then why not convert every fortress on our sea-coast into a West Point, and every post on the frontier in a training or preparatory school for those?

To develop this idea more fully and at length, let us suppose that enlistments in the U. S. Army were hereafter to be confined exclusively to sons of American citizens, between eighteen and twenty-two years of age; that the term of enlistment should be for six years, unless sooner discharged; that the first two years should be spent in frontier posts learning the life and duties of the common soldier, becoming inured to its hardships, strengthening and developing their physical systems, and acquiring the beginnings of their academic education, in

preparation for the next step. The duties of the common soldier are now none too well learned at West Point. It is perhaps the only essential point in an American army officer's education not thoroughly taught, and this only because the time is too short. The Cadets now learn nothing of caring for their own horses, of cooking their own food, of gathering their own fuel and forage, pitching their own tents, or loading their own baggage on transportation wagons. They would make none the less efficient, kind and considerate officers for the possession of such knowledge practically acquired. They would know what soldiers should do, and while seeing that those thereafter under their command, performed their duties, they would be able to instruct them how best to care both for themselves and their animals, on which often so much depends. It is skill of this kind which maintains the efficiency of a military force in the field.

During these two years, whether in post or camp, they could acquire the studies of the present first year of West Point. This would give occupation to the officers, for the tedious hours, now too often given to idleness and dissipation. The terrible *ennui* of frontier garrison life, among the ignorant and vicious, would be changed to the delightful enjoyment of association with manly and intelligent youth preparing themselves physically and mentally for a life of usefulness among men, and especially for greatest usefulness in the hour of their country's greatest need.

From the frontier post the next three years should be passed in some of the sea-shore fortresses, when the course of study now occupying three at West Point would be acquired, or better, the course of those three years could be improved by additional studies not now, for the lack of time, embraced in the course. The last year could be passed at West Point in the same course now pursued there in fourth year. The material and appliances for such instruction now collected there, as well as its location, and its historical associations, time honored and inspiring, all conduce to render it peculiarly adapted to such purposes.

Such, in brief, are the general features of a plan to put the United States in perhaps as complete a state of preparation as may be done without incurring, in time of peace, the burdens of a war establishment. How this will accomplish that purpose an effort will now be made to show.

Keeping in mind the fact that the United States can never be wanting in men or material or defense, but that they are sadly deficient in preparation; and not in preparation only, but in the means of easy and early preparation, from lack of anything like a diffused and general military knowledge, among the people and more emphatically from lack of a sufficient supply of trained officers; we shall see at once that any scheme which spreads such knowledge among the people at large or provides the supply of skilled officers, to that extent at least overcomes that defect; and renders ready preparation possible—sufficiently possible perhaps for all purpose the United States may ever be called upon to meet.

In a cadet army, such as is now indicated, the same rules of discipline and academic requirement that now obtain at West Point should prevail everywhere, relaxed somewhat perhaps in point of academic requirement during the last two

years. Many would fail physically during those two years, as indeed do not a few now at West Point. Many more others would fail academically in each year of the course. If the numbers of these failures equaled the proportions of those at West Point and the entire army was limited, as now, to 25,000, there would be discharged each year about 5,200. There would also be graduated about 2,500, thus making an annual displacement from all causes about 7,700 and giving place for like number of new appointments. These displacements would be distributed about as follows from each class entering 7,700. Of original class there would be discharged

1st	year	about	33%=2,541,	leaving	5,159
2d	"	"	17%=1,309	"	3,850
3d	"	"	9%= 693	"	3,157
4th	"	"	5%= 385	"	2,772
5th	"	"	3%= 231	"	2,541

who would be graduated with rare exceptions the next year.

A cadet army of 25,000 would give to each Congressional District in the United States a constant representation in its ranks amounting to near 70, and with the West Point ratio of discharges an annual appointment of about 20. The life, its openings, its association and its glittering possibilities could not fail to attract to it the very flower of the youth of the country. Recruiting officers would be no longer needed. Instead of poor vagabonds, waifs and social wrecks gathered from every clime but our own, we should behold an army of blooming, ambi tious, American youth engaged in emulous strife for the prizes of an honorable calling—the most attractive known to man.

On completion of their academic course and the period of their enlistment, such graduates as attained to higher honors, should be commissioned in the army to extent of filling existing vacancies. All others should receive honorable discharge. Of course, but few would receive commissions; but those few would be of the foremost rank in attainments, and best qualified as instructors in peace, as leaders in war. All should be assigned for future service; their discharges certifying to their qualification for infantry, cavalry, artillery or engineer service respectively, as they had severally manifested most special adaptation.

Of the undergraduates discharged—all whose dismissals were not brought about by breach of discipline or dishonorable conduct should receive honorable discharge and to every honorable discharge, whether of graduate or undergraduate, there should be affixed a rating or rank, as provision for future military service in case of war, to graduates—say as regimental field officers, undergraduates of four years' service as captains, those of two and three years' as lieutenants, and those of less as non-commissioned officers.

Of the 2,500 graduates, not more than 75 or perhaps 100 would, on the average, receive commissions. This is a larger number than the average of the annual graduations at present, but it is presumed that for a cadet army of the kind indicated, a larger proportion of officers would be required for instructors. There would then be 2,400 graduates returned annually to civil life and its pursuits, prepared to respond to their Country's call whenever services she had qualified them

to render should be needed. In addition to these, there could be annually returned to the same pursuits, 5,200 more of undergraduates, of whom about half, or 2,500, would have had a year or more of military experience, and who would, therefore, be more or less qualified to render valuable service in the instruction and command of raw volunteers.

In ten years' time there would thus be discharged into civil life, 25,000 graduates and about an equal number of certified undergraduates. In the same period of time probably half of these would become *hors du combat.* Some would be no longer living, some would be physically disabled, through the various ills and accidents of life, some would be abroad and some would be occupying positions of trust and honor, such as judgeships, legislative seats, or perhaps, executive chairs, where the service they could render their country in case of war would be greater than if in the field. Perhaps one-half could at all times be relied upon to respond to the first call to arms, and spring to the defense of their country. These would amount to about 25,000 educated, disciplined officers, accustomed to military life. This would afford ample skilled leadership for a force of 500,000 men. If less force were needed they would be only the sooner organized and disciplined by the larger proportion of veterans distributed among them.

Coming from among the people, they would bring with them the young men of the communities in which they would be living, who would be well acquainted with them and to whom their military education and experience would be well known, and who would thus feel confidence in their leadership and ability to command. Many of these graduates would probably be found employed, when the call came, as teachers in the schools and colleges of the country, giving instruction in military drill as well as in the sciences. Their pupils accustomed to look to them for leadership would feel the call of patriotism with that irresistible flood which comes from the impetuosity of youth, encouraged in its noblest impulses by the example and association of a respected and honored teacher. Again many would naturally be found, by choice of their fellow citizens or perhaps by State legislation to be commanders of the several state military organizations. In the principal towns such commands would naturally gravitate to their possession, by the rivalries of local military companies among themselves, seeking experienced leaders. Their soldiers would naturally follow their commanders into the field and these two sources, taking the aggregate of our National Guards and Colleges, would probably furnish the first quota, already more than half disciplined, ever likely to be required for any emergency which may fall upon the United States from foreign sources.

With a military system so arranged, our visible army, while filling all the functions of a present army, would still be only the training school of the real army which would be among the people. A place upon its rolls would be comparatively easy of attainment and the feeling of caste as well as all approaches of danger to our liberties would then naturally cease, for the American Army would then be an army of the people, with the people and for the people, understanding their liberties and knowing how to maintain them.

METEOROLOGY.

THE RICHMOND (MO.) CYCLONE.

COMPILED BY THE EDITOR.

On Saturday, June 1st, one of the most violent, destructive and fatal tornadoes ever experienced in this country, passed over the central portion of Ray county, about thirty-five miles east of this city, striking the town of Richmond, destroying over one hundred buildings, killing outright thirteen persons, and more or less seriously wounding more than seventy others.

The Richmond *Conservator* extra says: "A cyclone struck our city yesterday, at 4:05 p. m., and in the short space of five minutes totally destroyed one-third of the place, its path being nearly three squares wide and extending for over a mile in the city limits. It originated on the farm of Wm. H. Fitch, three and a half miles south of the city, and prostrated fences and crops in its path, and injured the premises of Jno. C. Laforge, where it lifted and struck again at Col. Warrenstaff's, destroying his stables, fences, etc.; then lifted again, passing over the residences of Captain J. L. Farris and James Hughes, and struck with full force the residence of William Jackson, and then continued with unabated fury, leveling everything in its path.

We noticed its approach from our office balcony, our attention being attracted by its peculiar shape, that of a funnel, the small end down, the color of steam. At times it would break, emitting volumes of what appeared to be black smoke, then gather together again and assume its funnel-like proportions, the wind all the while being attracted toward it. It came on slowly — not much faster than a man could walk — destroying everything by its infernal whirl, producing a sound like the roar of Niagara. Where it struck with its most terrific force, it peeled off the bark of trees, leveled the grass and shrubbery as if it had been rolled by a large roller, or been swept by a torrent. Trees and outhouses were carried bodily away, and the debris of the city fell miles from the city."

The Richmond *Chronicle* extra says: "The direction of the cyclone through the town was from south to north, direct, with a tendency to move west. Its motion was rotary; its appearance funnel-shaped, resembling a waterspout. Not a drop of water fell during its passage through town. There were ascending and descending currents. In its pathway the air was filled with debris. Its pathway has the appearance of having been deluged with muddy water, owing to the fact that a heavy rain preceded the cyclone a few minutes and the ground was wet, and the mud was smeared over everything. The time of its passage through town, to the best of our recollection, was three minutes. The cyclone swept over that part of town in which were situated most of our mechanical shops."

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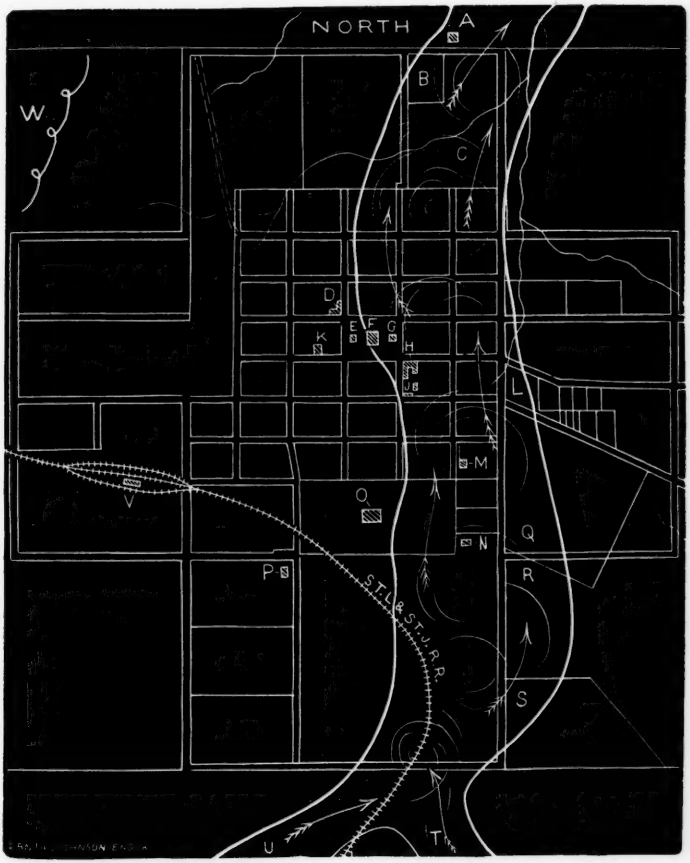
The Kansas City *Times* special dispatch gives the following additional items: "The storm struck the city a short distance south of the Presbyterian church, which it laid in ruins, carrying the immense bell into the middle of the street, and portions of the roof several hundred yards. One piece of timber on which was inscribed "Praise the Lord," was carried two hundred yards. The width of the storm's path was about two hundred and fifty yards, in which not a single house is standing. One house adjoining the Presbyterian church was taken off its foundation and carried a hundred feet where it was dropped down and pulverized. A large tree in front of a house situated on the extreme southern limits where the storm struck, was taken up by the roots, carried over a portion of the house and dropped, while the house remained untouched. The storm traveled toward the north, and the current was against the hands of a watch, as is the case with all cyclones north of the equator. The direction of the current was evident from the twist of the trees, and the manner in which the bark was peeled. The cyclone traveled about as fast as a man could walk, but it was not regular in its progress, sometimes going more rapidly than at others. It was formed in the shape of a funnel, and moved like a spinning top. At times it would become surcharged and burst forth, scattering the debris in all directions. Then it would gather again for a new onset, and at a short distance would strike again with indescribable fury. As above stated, there are no houses standing intact in the track of the storm. In most cases it went down into the foundations and took up the sills on which buildings rested, scattering them no one knows where. Scarcely a single piece of fence is left to mark the boundary lines between different properties.

The Old Cemetery, where the cyclone made its last stand before its retreat, gives perhaps the best evidence of the power and fury of this unparalleled storm. This is an old locust grove in the extreme north part of the town. There is not a tombstone but is leveled, and many of them broken into many pieces. Many of these graves can never be identified again. The trees have been twisted and whipped until there is not a leaf on them, and nearly all of them have been leveled to the ground. One tall locust stands erect and alone, but its bark has been peeled off from top to root as perfectly as a boy could peel a paw-paw for a whistle. This process of twisting off the bark gives a slight conception of the immense power of the cyclone. So great was the power of the wind that James Duncan was blown over three houses and instantly killed."

To the Kansas City *Journal,* which dispatched a messenger to the scene of the storm, we are indebted for the following interesting particulars: "We learn from Mr. Casey, deputy postmaster at Missouri City, that the cyclone gathered near that place between two and three o'clock. The steamer Fanny Lewis had left the landing, and was about a mile and a half down the river, when she was entirely hidden from view by a dense, muddy looking, funnel shaped cloud which passed near her and close to the water. This cloud then raised and passed to the right of the town, and at the same time another cloud of a like description passed to the left, the distance between the two being estimated at about two



The trail of the cyclone is indicated by arrows and circles, and its boundaries by the white lines east and west: A—Direction of Cyclone on leaving the city; B—Old Cemetery; C—O. A. McFarlany, D Hudgins' house; E—Office in court house yard; F—Court house; G—Building in court house yard; A—Brick block on east of square; J—Shaw House and buildings; K—M. E. Church; L—Major R. Sliner; M—Baptist Church; N—Presbyterian Church; O—College; P—Kelsey's addition; R—Joseph J. Hughes; S. J. Wetmer's heirs; T and U the point at which the two wings of the Cyclone united; W—Manner in which the Cyclone moved on its eastern edge.

miles. As they swept in a northeast direction they made a noise resembling the running of a heavy freight train, and attracted general attention. Far off in the distance they appeared to unite in one immense cloud, and descend toward the earth. The day had been intensely sultry, and when the clouds were passing Missouri City, great drops of rain were falling; and such had been the character of the weather throughout the day.

When it reached Richmond Mr. David Whitmer was standing in the back door of his stable, and says that two dense, black, funnel-shaped clouds

appeared to unite in one, and to come onward, with the small end of the funnel down. This appeared to act as a sucker for the vacuum of the funnel, and would draw all objects in its path upward with a sifting motion and then scatter them broadcast over the ground. It would draw a house up from the earth, and shake it back and forth like the vibrating sieve in a fanning mill, carrying the lighter portions up into the funnel, and letting the heavier ones fall. It moved slowly—slow enough some say, for a man to have escaped from its track. It appeared that whenever the vacuum in the funnel became filled or overcharged, the cloud would burst, and then buildings would be swept clear to their foundations, and the ground swept as clean as if by a broom. Then it would belch forth its contents of debris, timbers, mud, water, looking, as eye witnesses report, like a building on fire, surcharged with flame and smoke. This characteristic appears to account for the almost wonderful preservation of lives and property in some instances, while all around was scattered dire destruction."

It entered the city first on the track of the cyclone of eight years ago, and came far enough down to pay its respects to the *Conservator* printing office of Mr. Jacob Childs, from which it lifted a portion of the roof; it then hung in that vicinity for several seconds, when it took the back track, paying its respects to the roof of the saving's bank, and departed again to the south, where it united with the cloud as seen by Mr. Whetmore. After striking the residence of William Jackson, on the hill in the southern suburbs, which it destroyed, it mowed a swath three hundred yards wide to the extreme northern limits of the city, clearing from the ground every vestige of improvement, leveling the strongest buildings to their foundations, and carrying the composing materials of their construction in its deadly grasp far away. In some instances it went beneath the foundations of strong two and three story buildings and dug out heavy sills, 18 inches square and 16 feet long, and carried them beyond human knowledge. The wonder is now in looking over the ground, not that so many were killed and injured, but that any escaped. War, in all its terror, never wrought destruction such as is here visible on every hand. The human mind is too weak to grasp the picture, much less to paint it in words. Great trees were torn up by the roots and hurled rods away, others stripped of every leaf and twisted off near the ground, (and in every instance against the sun, or from the west to the east.) From the ground to the topmost twig others are entirely stripped of bark and branch—shaved as clean as a whistle.

In the old cemetery there probably is to be seen the most impressive evidence of the force and power of the cyclone. It occupies about an acre and a half of ground, was thickly studded with stones and monuments, and shaded by a heavy growth of locust trees, many of them eighteen inches through. Four-fifths of those trees were twisted off eight or ten feet from the ground, or even uprooted, and the few that remain standing have been stripped of bark from the roots to the topmost twig. Every stone and monument is overthrown or broken off and the ground is pulverized and grass scorched as if burnt by a cloud of fire.

All day Monday and Tuesday the owners of private residences were in many

instances engaged in searching in the vicinity of their once homes for household relics, only too rarely found. In a few cases the house had been swept from the sills, leaving the boards of the ground floor in place covered by the carpets, and these were being removed. In one house there remained a piano, in another a bureau, each only slightly injured, the latter being of special interest in having preserved the life of a mother and child who were prostrated in front of it when the house was swept away, and a mass of falling timbers that were dashed downward found support in its unyielding strength, and the mother and child protection at its base, while a few feet away another woman, an inmate of the same room was crushed to death. The post office was entirely swept away, not a plank of it being left in place. The mails were scattered to the winds, and some have since been returned from a distance of twelve miles. The stamps, moneys, books and accounts were all lost.

The remarkable features of the visit of this disaster are many. Among the first to observe it was Mr. Jacob Childs, editor of the *Conservator*, from the balcony of his office. Eight or nine years elapsed since he last saw one of these engines of destruction whirling on its course, and he had felt, as well as seen, its effects through the utter destruction of the upper story of his office. He at once ordered the office closed and started for home, and had gone but a few rods when the roof of the establishment he had left was drawn up into the air, forcing from him the exclamation of "The *Conservator* is gone this time!" Here it moved in mid air for a few seconds, keeping up a violent rotary motion, and emitting a sound which he describes to have been "like the roar of Niagara," until, as if drawn by some attractive force, it retraced its path to the southern limits of the city, and over the railroad track formed a junction with a similar atmospheric or electric machine, and swept on in its broad and wide-spread course of destruction as laid down in the diagram. On the east the line of demarcation between the property destroyed and the property left intact is almost as unbroken as the swath cut by a mowing machine, while on the west the line of total destruction is broken, not unlike the teeth of a lightning saw blade, with a loop formed at the point of the teeth, as seen in diagram at W; between these teeth trees, dwellings and all manner of objects would be left unscathed, while all around, and partly to the rear of them, every object would be wiped away. This is seen by the large two-story frame building on the hill south of town. The dwellings opposite on the west are gone to their foundations, and also on the north. The smoke house and out building to the south were leveled to the ground, and a large tree growing on the west, and only a few feet distant, at least eighteen inches in diameter, was parted from the roots about eight inches below the ground and lifted up and carried over the porch and deposited to the east, and not to exceed thirty feet from the place where it was growing. The sod at its roots was undisturbed; it was pulled as a tooth would be pulled by a turnkey and broken off in the jaw. This house with the shubbery surrounding it was left undisturbed save the loss of its chimneys and a few shingles. Not even the glass in its windows were broken. A few rods further down the street a large frame cottage was lifted from

its foundations, and carried over the fences and dashed fifty feet away into the street a heap of scattered ruins. The fences were undisturbed, the roses are blooming in the yard as before, but the soil under the house is as hard and barren as a parade ground. Nothing in the track of this monster was simply toppled over. Everything was lifted up by the neck of the funnel and carried into the body of the cyclone, to be afterward dropped, except at those times when it appeared to discharge itself with an outward explosive force, and then swept onward with renewed strength. Its looped and jagged edge on the west is instanced all along its course. As above in cutting all around the house over the porch of which the tree was carried; by the frame house adjoining the Presbyterian church, which was moved from it foundation a few feet but left standing, while the massive brick structure adjoining it, and within a few feet, was leveled to its foundations; by the court house, from which a portion of the roof was taken and all the chimneys cleaned, the towering belfry being left intact. Again, by the entire escape of the fine two-story residence north of the post office, which escaped almost without injury, either to itself or the beautiful grounds in which it is located, and lastly beyond the "old cemetery," where it crossed the road and went around Roterside's place, and again returned to the road a few yards beyond. It followed the line of shops and the slope of the hill that runs towards the valley east of Thornton avenue, only crossing that street with its jagged edges; and in no instance going fifty yards beyond to work excessive damage, and the citizens believe it was attracted along that line by the electric elements which were there contained in larger quantities than in any other part of the city. Every one of these establishments was leveled with the ground. In support of this electric theory is the fact that out of the wreck of the wagon shops and from the ruins of many carriages and buggies throughout the city the country is strewn with fragments of vehicles, and parts of them are found miles away. In most instances the iron work is broken or twisted, the spokes have been stripped from the wheels and the tires bursted asunder. Sewing machines were invariably broken into fragments, and agricultural implements appeared to have had special attractions for cyclonic fellowship. A gentleman who was picked up and whirled in the cyclone, says he was at work in the yard, and that his attention was first attracted by the noise made by the approaching cloud. He looked toward it and saw it coming with a roaring noise that was almost deafening. He had time to run from it, but could not; he stood petrified and in speechless astonishment. It lifted building after building into the air, and appeared to throw the fragments aside in a sportive, playful manner, but with an awful grandeur that appalled him to the heart. Soon he was caught in its grasp, raised, from the ground and whirled around like a spindle in a loom, and finally dropped or hurled against a tree, over a hundred yards distant, to which he clung with the tenacity of despair until several minutes after the danger had passed. He was bruised all over, and covered from head to foot with a coating of drab-colored mud, the same as that which has painted every object in its track.

There were times in which the monster was as gentle as a lamb. In one of

the streets it picked up a little colored boy five or six years old, carried him a hundred or more yards, and then gently deposited him in the midst of a mud puddle, and the surprised youth was extracted finally without a scratch. It carried away every article of furniture of a room in the Shaw house after taking off the roof, and left hanging on the walls a lady's sundown. We have already written that it swept away dwellings and left the shrubs and flowers at the doorsides to bloom as before. It was a fear and a wonder moving over the face of the earth, and man can test his own weakness by its strength.

In minor incidents the passage of the cyclone was rich. Into a tree near the old cemetery a piece of glass was driven nearly four inches. It was an eight by ten sheet, and had struck at the corner. The bell of the Presbyterian church, nearly a ton in weight, was whirled thirty feet from the church foundation and cast unbroken to the street, and a portion of an arched altar or window ornament that had graced the inside of the edifice, and on which the name of the Lord was painted in gilt letters, was laid down beyond the Shaw House. A rabbit was driven head first into an old stump and so tightly wedged that it could not be pulled out, and feathers out of innumerable feather beds had been driven quill first into the bark of trees, clothing the monarchs of the forest with down, after stripping them of leaves.

Beyond Richmond, that is, after mowing a swath from the extreme southern limit of the northern one, it lifted itself from the ground and made a jump of two miles, coming down at the farm of Mr. Thomas Bohannan, near the bridge over Crooked river. The dwelling and all improvements were cleaned up to their foundations. Mr. Bohannan and wife, who are among the oldest settlers of Ray county, having lived on their farm almost fifty years, were both severely injured. The cyclone then paid its respects to the iron bridge, which it doubled up and twisted out of all shape, and entailed a loss on the citizens of Ray county of about three thousand dollars. It then called at the residence of Mr. Hughes, on the Wasson place, and destroyed the farm house, barns and stock. Continuing on its course it took in the farm and vineyard of a German named Vermilious, and thence to the widow Johnson's, wrecking everything in its course, until it reached Hiram Settle's place, a point about two miles beyond, on the main prong of Crooked river, in the mean time whirling through the heavy white burr oak timber of the wooded bottoms, prostrating the monarchs of the forest to the ground, or twisting them off in its inexorable grasp. It passed over the little village of Molton, in the eastern portion of Ray county, and came down at Highsinger's, a point twelve miles beyond Settle's, and on the edge of Ray and Carroll counties, the house being divided in its taxes by the county lines. It no longer exists. For a few miles in Carroll county it appears to have repeated its work in Ray, and also appears to have changed its course from a northeast to a southeast direction, passing in the vicinity of Carrollton near enough, it is said, to be heard and seen, but only dropping its compliments in the shape of immense hailstones, containing at their center mud and grass. The cyclone was plainly

seen at Norborne, and for a few moments occasioned great consternation among her citizens."

This closes the account and description of the cyclone, to which we append a few extracts from the editorial comments of Col. R. T. Van Horn, who has given much attention to meteorology, and whose recent article on the "Atmosphere and its phenomena," read before the Kansas City Academy of Science, published in the *Review* for February, 1878, attracted so much notice:

"The tornado has become a fearful thing, and our neighbors of Richmond, Missouri, are to-day mourning over a calamity that will become a memory in its history for all time. Short and terrible was the work. Eight minutes is the time stated, but minutes in such cases are ages. We do not know that a knowledge of the law of tornadoes would be of any practical benefit, for unless that knowledge led to methods to dissipate them, there would be no protection. We believe they are of more frequent occurrence in given localities than in others. Of course this is true as between the tropics and the temperate zones, but we believe it to be so in the latter. There is a district of country traversing Alabama and Georgia that is noted for the frequency of these storms, and in the country north of the Ohio river there is a belt in which they occur every year. It is so, measurably, at least, of Southwestern Kansas and across a portion of Nebraska. The recent terrible tornado of Wisconsin was in a portion of country that has been frequently visited—only last year there was one of almost equal power with this. Then there is a frequency of them in a strip of country extending from Alton above St. Louis south of that city, that cannot be ascribed to mere accident. On the contrary there are districts of country between these, where tornadoes have never been known to occur. These facts are sufficient as a basis for investigation, as they cannot be merely accidental.

In former years we have referred to this subject at length, so that it is not necessary to repeat the arguments and facts now. What little attention we have been able to give to the phenomena, and where we have been able to trace the lines of a tornado for a long distance, we have found them in every case to correspond in their movement to lines of mean temperature as laid down on the isothermal maps. But they are not like an ordinary storm, continuous, but rise and fall like a balloon, and it is only when they touch the earth that they leave any evidence of their passage. Thus the tornado that devastated Richmond may have bounded from the ground and spent itself in the upper air, or it may have come down again in Illinois to be regarded as a separate one entirely. But sometimes they travel so nearly on a plane as to be traced for hundreds of miles. In all such cases that we have investigated, the fact that they followed lines of mean temperature, or were coincident with them, remains.

"The reporter of the *Journal* yesterday gave the only full and satisfactory account of the Richmond disaster in the matter of casualties that has been published. This morning he gives a number of incidents and facts which bear on the theory of these mysterious phenomena, and which seem to bear against the wind theory as the destructive element. The other theory is electricity—or in

other words that the objects on the surface are lifted by electric force into the cloud, instead of being blown by a moving wind. The cloud is like the pole of a battery positively charged, and the earth a pole negatively charged. Now place a bar of iron or any conducting substance across and touching the two poles, and the equilibrium is restored. The theory in this case is, that the houses, trees and movable objects taken up are the conducting media, and as soon as the equilibrium is restored they are dropped to the earth again.

"In the incidents related by our reporter, this theory seems to be generally and as a rule sustained. The objects taken up are not blown in advance of the storm, but are invariably shot upward into the interior of the funnel-shaped cloud and dropped from the more expanded mass above. If it was wind they could not be dropped. Then we find a roof lifted and set to one side and the building below the roof uninjured. This cannot be from even wind moving in a circle without lifting power at the same time. Again, trees are sometimes torn up by roots and carried up and let down. A wind with only forward or horizontal force would have prostrated the tree simply. In other instances trees are left standing but stripped of bark entirely even to the twigs, which are otherwise intact. This cannot be the effect of wind in any of its movements or in any direction of its force—it must be another force. And as electricity must pervade the body of the tree acting outwardly, the denuding of the bark is in harmony with this action. And finally we have instances where it went below the surface down to the foundations, and tore from their beds masses of timber sills eighteen inches square and sixteen feet long. This could not be mere wind moving horizontally. We next have the bounding movement of the cloud, coming to the earth, taking up a mass of material, dropping it, and rising into the air again, and coming down at other points. Is not this the result of differing states of equilibrium, exhausting its power, and when discharged of it, accumulating more from the surrounding conditions? It touched as many as six places in Ray and Carroll, bounding from two to four miles at a time.

It was also attended by a great development of heat, the grass and trees having the appearance of being scorched, and the cloud emitting volumes like black smoke. We have no direct testimony in this case as to actual flame, although this is not an uncommon phenomenon. This is of course electrical, and strongly supports the theory we have been considering. The roaring noise could not be the result of motion alone, for it was louder than even thunder, and it was moving at times no faster than a man could walk. This must have come from intense internal action.

Finally we have its motion in the direction opposite to that of the hands of a watch. The movement seems to have been on a straight line on the southern edge of the cyclone—that is the track of destruction makes a straight line on the southern edge of the storm track, while on the northern edge it is uneven. For example, a house on the north edge is totally destroyed while another in a direct line with it is untouched; then another swept clean and beyond it a house unscathed. We cannot describe it better than to lay a cord down on the floor with loops in it

at intervals. The loops represent the points of destruction, and the intervals where no damage was done. This is one of the most remarkable instances we have ever known in the history of the cyclone, and we have no doubt but this Richmond tornado will, from its destructive power, the slowness of its movement and the length of time it was observed, become one of the most noted for its scientific value.

A CHINESE TORNADO.

Correspondence of the Hong Kong *Daily Press*, dated Canton, April 14, gives the following particulars of the terrible tornado which visited Canton and its suburbs on the 11th of April: Passing ever the Shameen settlement the storm crossed the canal to the city, carrying away in its course the balustrading of the East bridge. A native police station opposite was also completely destroyed. The storm leveled all the houses in its course, making a clean sweep of everything for a width of about six hundred feet. The mortality has been variously estimated at from five to ten thousand, and probably the latter number is nearer the mark. Nine thousand houses (speaking in round numbers) are known to have been destroyed, and although many of the inmates had notice of the impending disaster by hearing the noise caused by other houses falling, and made their escape, there were other cases in which great numbers of people were killed by the fall of a single house. For instance, there was an eating-house in which fifty-two assistants were engaged. In this house there were at the time over one hundred people taking refreshments, and none, either assistants or or guests, are known to have escaped. In another case twenty-four persons were killed by the destruction of a family house. There was also great destruction of boats and life on water. Allowing, therefore, for there being no one in many of the houses at the time of their fall, and, on the other hand, allowing for there being great numbers in some of those that fell, it is probably below the average to estimate the loss of life at one to each house that fell, and a thousand lives on the water. In most of the houses blown down fire was probably beirg used, either for cooking or other purposes, and kerosene is now so universally burned that it would have been no cause for surprise had the conflagrations been much more extensive than they were. As to the clearing away of the dead bodies, the Chinese authorities seem to have acted with commendable promptitude. Almost immediately after the catastrophe orders for four thousand coffins were issued by the Ol Yuk Tong hospital, and up to the time the steamer left yesterday afternoon three thousand bodies had been recovered from the ruins and buried without delay. The work of clearing away the debris was proceeding rapidly, but the stench in some places was unmistakable evidence that there were dead bodies still to be extricated. The violence of the wind for the few minutes it lasted was as great as that of the severest typhoon. Granite blocks were lifted from their places and hurled a considerable distance; thick trees snapped in twain like twigs; roofs were lifted bodily, and boats carried far on to the shore. In

one case a small boat was actually blown on to the roof of a house in the Tenth ward. A row of houses—all brothels but one, forming one side of a short line in the city—were the scene of one notable catastrophe. The other side of the lane is formed by the side wall of the Nam Cheong temple, which is some thirty feet high. This wall gave way to the force of the tornado and fell crushing in upon the opposite houses, the inmates of which, about one hundred in number, were all killed, most of them being crushed to death, and the remainder suffocated. There was no means of exit at the back, and no one attempted to dig the bodies out of the ruins. The narrow creek is still partially choked up with debris, consisting of broken boats and other wreckage, in which are numbers of dead bodies. In too many instances whole families have been crushed to death in one boat. The supply of coffins is nearly exhausted, and the undertakers are now, I am told, charging double price. The villages of Pah Hin Hock and Pah Hock Tang, two or three miles to the north, outside the walls, were caught in the storm and suffered great damage, many dwelling houses and other buildings being destroyed and numbers of lives lost. The village across the water opposite the Shameen came in for its share of the disaster also, being partially destroyed. I hear that, though the whirlwind did not effect so much damage at Fatshan as in this port, it has made severe havoc. It is stated by Chinese who have come from there that no less than two hundred houses have been laid prostrate, while about half the boats in the river there have been wrecked. The loss of life has been put down at several hundred. A passage boat coming from Fatshan to this city was, when a short distance off, caught in the tornado and instantly capsized. About seventy of the passengers were drowned. The tornado, it appears, came from a direction quite contrary to that in which the cloud had been traveling immediately preceding it.

MINERALOGY.

MR. BRAGGE'S COLLECTION OF PRECIOUS STONES.

There are few private individuals who have made more rare collections than Mr. Wm. Bragge, F.S.A., of Sheffield. His magnificent collections of pipes, snuff boxes, &c., shown at one of the London International Annual Exhibitions at South Kensington, must have struck most visitors. At a recent annual conversazione of the Birmingham and Midland Institute, he generously lent another of his splendid collections—that of agates, silicious, and precious stones. The glass cases were nearly all filled by the wondrous specimens of natural beauty and artistic work, which are scarcely surpassed even by the Imperial Museum at St. Petersbug. The beautiful examples shown were not only interesting to the mineralogist, but especially so as rare specimens of the lapidary's art, and consequently interesting to large numbers of art-workers of Birmingham. It would

be difficult to describe the rich and rare beauties of these articles, nearly every one of which is a marvel of the eccentric and exquisite beauty of natural productions, originally hidden in a rude crust, and only displayed in their true glory when sections have been made, and the latent inner beauties disclosed. The cases included a wonderful variety of all sorts of silicious stones, and a large number of the rare and valuable precious stones, of every conceivable color and every variety of form. On the left, on entering the Museum, a number of examples of silicious wood were shown, in sections and boxes, in all of which the silica has replaced all the varied outlines of the wood in the most graceful and fantastic forms. All these specimens are so rare in beauty and so delicate in structure that it is difficult to believe that they are only subtle works of nature in the secret places of the earth. Next came superb specimens of jade—one of the richest but most intractable materials ever subjected to artistic treatment. In many jade ornaments years of labor have been devoted to the mere mechanical work of cutting away the surface and leaving the strange forms of oriental taste. Jade is not merely white, as is generally supposed, but is here to be seen green, clouded and opaque. One of the *plaques* is a marvel of art, a double pattern, one under the other, being carved with infinite patience and the rarest taste. A little bottle, with a delicate chain and stopper, carved from a single piece of white jade, semi-transparent, was a surprising piece of workmanship, and another bottle had a lapis-lazuli stopper executed skillfully. The moss-agates were very interesting, the delicate outlines of the fern-like stems and leaves being imbedded in a transparent body, causing an exceedingly beautiful effect. The Mocha stones and the Egyptian jaspers claim notice; although mere baked clay, stained with iron, they were rich in color, and one example of red jasper, and some others, as boxes and pipes, must be wonderfully rich and rare. Three trays of bloodstones arrest attention, and snuff-bottles, with carnelian, green jade, and tourmaline stoppers, and a curious snuff-rasp. Next came a mass of aventurines; some slabs and sections of the curious catseye stones, rough and polished; and a double case of thirty oval stones (the central stones of a fine ring, changeable every day for a month), some being inlaid with rubies gave a magnificent illustration of Oriental art and taste. There where trays of opals, some being mounted as a sort of buckle for a mandarin's belt; also superb specimens of labradorite, the full iridescent beauties of which, magnificent in color and dazzling in brilliance, can scarcely be appreciated by any artificial light. The pink tourmalines and chrysoprases, were wonderfully varied in color and often exquisite in form. One large oval slab of serpentine, some ten inches by six inches, looked like a rich dark-green mass, but it is really semi-transparent, and has a strange richness of color from the number of garnets which are buried in its surface. The numerous lapis-lazuli stones of the collection were rich in the extreme, and a large spill-jar of huge size and fantastic form, rich in dark-green color, and quaintly carved, at once arrested attention as a marvel of material and art. Next to this was a great block of malachite, of massive and quaint form, and superb in color. Then a tray of fine sapphires, nine in number, and of great variety of color, brilliant in

tone, and splendidly cut. Tourmalines, moonstones, and corundums fill the next few trays; and then a fine selection of turquoises fascinated the eyes, being ornamented with Chinese and Persian art, tastefully outlined, and inlaid with lines of gold, and others shaped into bottles, of beautiful and graceful forms. The case of emeralds caught the eye at once, and showed many wonderfully varied in shade of color. The emeralds in the rough were remarkably interesting, and the amethysts specially superb in color. Among the rubies, sapphires, and opals, one magnificient sapphire, being 2½ in. by 1¾ in., excited great interest and admiration. Topazes are usually believed to be only yellow, but here there were specimens of many shades of color, and one was particularly interesting from its having an Egyptian hieroglyphic *intaglio*, the "cartouche" or signature being indentical with that carved on Cleopatra's Needle. Three enormous examples of Brazilian yellow topazes deserve special attention from their size and color; while five pink topazes, five catseyes, two obsidians, three aventurines, four turquoises, with some labradorites and chrysoprases were far too fascinating to be passed without a long admiring pause. The next case contained some remarkably splendid examples of old Roman mosaics and of modern Florentine Pietra Dura, and Viennese "incrustation work," an embossing of precious stones on an equally precious base. In this case, not only fine examples of the best Roman mosaics were displayed, but one of the smaller slabs, a view of a bridge and castle, looked more like a miniature than a mosaic, so microscopic were the stones and colors of which it is composed. The cameos in the same case deserve special mention, that of the late Prince Consort being in very high relief, while the two large oval shell-cameos are superb samples of the engraver's art. Passing many of the minor beauties, the attention was next riveted by some fine carnelians, of all shades of color, from pale gray to deep blue and red; and, although some of the bottles show that red and white are all in a piece, it is difficult to believe that one beautiful buckle of pure cream color, with exquisite red berries, is all carved out of one piece of stone. The next case contained rock crystal, in all sorts of forms, one large block, full of fairy-like forms of grass and reeds, looked like a landscape framed in crystal, the filaments being exquisitely delicate in form and graceful in arrangement. Another quaint form—a Kylian—a jaguar or leopard, has many small, deep, black spots in its very depths, where nature had quaintly set little flakes of carbon. One vase-like form of seal is a splendid piece of the very finest rock crystal, of pure, brilliant white; while other specimens show the same materials, as bottles, and seals, and buckles, of various shades, down to dark green and almost black. The large flat-oval forms of strange color are Chinese seals, made from Siberian rock crystal, and one of the many snuff-bottles shows a spoon and some of the snuff which once belonged to a Chinese emperor. The mineralogist could not avoid noticing one of the freaks of nature in a small specimen of exquisite color and curious form, where a "foot stalk" runs out of, or rather into, the main crystal in an eccentric style; and there was also exhibited nature's strange way of breaking up her own beauteous works in the numerous cracks which slowly extend through the choicest examples of her own cunning art.

In the next case, chalcedonies appeared, in all sorts of form—a dainty little tray, pipes, bottles, double snuff-bottles, and a magnificient example, with a ruby stopper, once in the cabinet of Count Palikao, as part of the "loot" of the Summer Palace at Pekin. Another case contained some remarkable curiosities—large flies made up in rock crystal, a monkey in jasper, boxes in agate, specimens of Swedish porphyry, Scotch and German agates, German and Indian jaspers in many varied forms of boxes, pipes, and slabs. The agates alone not only occupied one whole length of cases nearest the wall, but were also dispersed through the middle case too. These agates are of every conceivable color, and are from Uruguay, Siberia, Nerbudda, the Ural Mountains, &c., and are not only beautiful to the ordinary eye, but are full of interest to the mineralogist and the lapidary. They include all varieties—the mural-agates, which look like the plans of the fortifications of Coelhorn or Vauban, and the moss-agates, of such rare and delicate beauty as only the pen of a Ruskin can describe. The jaspers from the Ural Mountains—ten very fine examples—forming the stem of one pipe, and varying from delicate cream-color to red, and so hard that when painfully cut they serve as pipe bowls for years, the cups and trays of hornstone from Germany, the splendid examples of conglomerate, obsidian, and lava are worthy of the closest inspection and the most unstinted praise. Even amber, which to most people means only a light-yellow, glossy substance, useful for pipe mouthpieces and beads, is there shown in every tint and shade, clear and cloudy, pale and dark, milky-white, and raven-black, and with the traditional long-imprisoned "flies in amber," which are here artistically preserved. These specimens are especially interesting from their size and form, as well as their varied colors; and if the labradorites in the same case are seen with a lucky light, their brilliant iridescence, their flashes of bright dappling color, their banded, striped, and spotted lamina, will never be forgotten. Another and the last case we have left room to mention, contains specimens of almost more interest, because easily appreciable, and yet rarely seen, the specimens of the Shantung cameo-glass—a double layer of glass, generally white, over which a layer of various other colors is fused, and then cut through in cameo-fashion, with marvelous skill and exquisite taste. Many of these specimens will be usefully contrasted with the large glass cup of modern Munich work—a fine contrast of oriental and occidental art. In the same case were three remarkable specimens of pearls—one the shell, the other the natural pearl, and the third a bottle encrusted with artificial pearls, produced by irritating the pearl-oyster to a diseased secretion of the much-prized pearls of fashion.—*London Journal of Applied Science.*

The Sutro Tunnel has been pushed on to a distance of 18,400 feet, and is now within fifty feet of the great Comstock lode, where its usefulness and value will be tested. Thus far the expenditure has been $2,830,597; $250,000 more will complete the work, after which $500,000 will equip it. Its object is to afford a natural outlet for the waters of the Bonanza mines.

THE NEW METAL, "GALLIUM."

Prof. Odling delivered a lecture recently at the Royal Institution, London, on the new metal, "gallium." The Professor said that the number of kinds of matter known to chemists which they have not succeeded in decomposing, but can trace undecomposed through distinct series of combinations, is sixty-four. These have been roughly classified into metals, semi-metals and non-metals, the first class being considerably the most numerous, and the several classes merging gradually into one another. The latest known of the non-metallic elements is bromine, which was discovered in 1826 by the eminent French chemist, recently deceased, M. Balard. Within the last twenty years, however, five new metallic elements have been discovered, being at the average rate of a new element every four years; while some evidence of the identification also of yet a sixth new metallic element has recently been put on record. But the latest known of the fully made out new elements is gallium, which was first recognized by M. Lecoq de Boisbaudran, in the autumn of the year 1875, and so named by him in honor of the land of its discovery, France. Like its four predecessors made known within the last twenty years, gallium was discovered by the process of spectrum analysis, applied in this instance in a special manner contrived by the ingenuity of M. de Boisbaudran himself, long eminent as a spectroscopist. The spectrum of gallium is characterized by two marked violet lines, the less refrangible of them being especially brilliant. Hitherto the new metal has been recognized only in certain varieties of zinc-blende, that of Pierrefitte in the Pyrenees having furnished the chief portion of gallium hitherto obtained from any source whatever—nearly half a ton of this ore having been employed by M. De Boisbaudran to furnish the dozen grains or so of metal wherewith he has been able to establish the leading properties of the element. In its appearance gallium manifests a general resemblance to lead, but it is not so blue-tinted nor quite so soft, though it is really malleable, flexible, and capable of being cut with a knife. Like lead again, and unlike zinc, gallium is not an easily volatile metal. Unlike lead, however, it acquires only a very slight tarnish on exposure to moist air, and undergoes scarcely any calcination at a red heat. The specific gravity of gallium is a little under 6, that of aluminum being 2.6, that of zinc 7.1, and that of lead 11.14. A most remarkable property of gallium is its low melting point. It liquefies completely at 86° Fahrenheit, or below the heat of the hand; and, still more curiously, when once melted at this temperature, it may be cooled down even to the freezing point of water without solidifying, and may be kept unchanged in the liquid state for months. Indeed, in the original communication of its discovery to the French Academy, it was described as a new liquid metal, similar to mercury; but on touching with a fragment of solid gallium a portion of the liquid metal in this state of so-called sur-fusion it at once solidifies. Unlike lead, again, gallium is a highly crystalline metal, its form being that of square octahedron. In its chem-

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ical habitudes the rare element gallium shows the greatest analogy to the abundant element aluminum. In particular it forms a sort of alum not to be distinguished in its appearance from ordinary alum, but containing oxide of gallium instead of oxide of aluminum or alumina.

But the chief interest of gallium, from a scientific point of view, is connected with the history of its discovery. All previously known elements have been discovered, so to speak, accidentally, and their properties have been not in any way foreseen, but rather met with as subjects of surprise; but the blende of Pierrefitte was deliberately taken up for examination by M. Lecoq de Loisbaudran in the expectation of finding a new element—an expectation to which he was led in the course of his study of the spectra of known elements, by a train of speculation of which he has not yet made known the details. The existence of an element having the characteristic properties of gallium was, moreover, upon entirely different grounds, predicted very definitely by a Russian chemist, M. Mendelejeff, in 1871, and in a more general way several years earlier by an English chemist, Mr. Newlands. This double prediction was based on a study of the relations of the known atomic numbers of the elements. These numbers have only lately been perceived to form a tolerably continuous seriation, which, again is associated in a remarkable manner with the seriation in properties of the elements themselves. In the series of numbers, however, certain terms are here and there missing, and in particular a number was missing which should belong to an element having properties intermediate between those of aluminum and iridium. What these properties would be was predicted in most minute detail by M. Mendelejeff in 1871. He predicted, for example, that the specific gravity of the missing metal would prove to be about 5.9. Operating on very small quantities, M. De Boisbaudran, in the first instance, found the specific gravity of gallium to be 4.7; but on repeating his determination in 1876, with special precautions and on a somewhat larger though still very small scale, he found it to be exactly 5.935 —certainly a most remarkable fulfillment of the prediction with regard to it.

—*London Chemical News.*

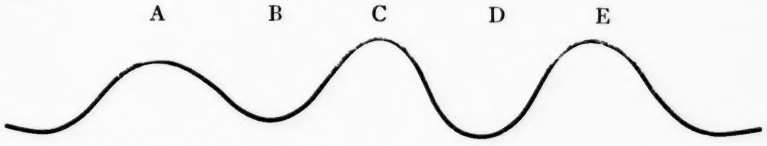
ARCHÆOLOGY.

ANCIENT EARTHWORKS IN SALINE COUNTY, MISSOURI.

BY PROF. G. C. BROADHEAD, PLEASANT HILL, MO.

In 1872 I visited an interesting locality in Saline county, about four miles southwest of Miami, where were observed ancient earthworks, walls and ditches, on a high ground in a dense wood. It approached a circular form, though of quite irregular shape, caused by ravines breaking off near the periphery, the

walls becoming reëntrant at such places. The space enclosed was about forty acres, around which there extended three ridges and two valleys or depressions, the remains of former ditches. The cross section of which was about as annexed:



A—1½ feet high, 10 feet wide. B—10 feet wide, 3 feet deep. C—3 feet high, 8 feet wide. D—6 feet wide, 3 deep. E—3 feet high, 8 feet wide.

The two ridges C and E extended entirely around the enclosed area and apparently were formed of the earth excavated from the ditches, and are about three feet above the bottom of the ditches. They have undoubtedly been much higher, the ditches correspondingly deeper, at some former period in the remote past. No rocks were seen near by or in the inclosure. Black oak trees from three to five feet in diameter were noticed as growing over the walls and ditches and the inclosed area of the entire space was covered with a dense growth of bushes, vines and trees. In the neighboring fields human bones, spear heads and fragments of pottery have been plowed up. I, myself, observed in the neighborhood many fragments of pottery, with arrow and spear heads of flint.

INDIAN STEATITE DISHES.

A very interesting discovery has recently been made by Mr. H. N. Angell, of Providence, R. I., showing how the Indians formerly manufactured steatite dishes. As he was quarrying about a ledge of rocks near his home, early in the month of February, he came upon a bed of soapstone, which bore evident traces of having at one time been artifically worked. Cart loads of steatite dust and chippings were removed before the ledge could be uncovered, when it presented a very peculiar appearance, being covered by protuberances and depressions. A number of finished vessels were obtained and many more in partial state of completion. The pots were first rudely carved out of the rock with slate or stone knives and chisels, bottom-side up, and were then removed from the mass by inserting wedges beneath them, after which they were hollowed out. Mr. Angell states that "the soap-stone bed, as now uncovered, is about thirty by ninety feet in extent, and all of the surface has been worked. We found by excavating in other places in the vicinity, stone hammers, chisels and sledges that will weigh from fifty to one hundred and fifty pounds. We also found a rudely wrought stone which resembles a plough and which will weigh over one hundred pounds." The bed of steatite had been lowered several feet by the removal of the stone, and it is certain that great numbers of vessels were fashioned at this quarry.

—*Amer. Naturalist.*

OBSERVATIONS ON THE DIGHTON ROCK INSCRIPTION.

BY CHAS. RAU.

In an article on the lately discovered Davenport tablets (published in Vol. II. of the proceedings of the Davenport Academy of Natural Sciences), Dr. R. J. Farquharson enumerates the inscribed stones found in this country, including among them the celebrated Dighton Rock, near the mouth of Taunton River, in Massachusetts. This rock, as is well known, bears an Indian pictograph, which has been quite plausibly interpreted for Mr. Schoolcraft by Chingwauk, an intelligent Algonkin Indian. He threw out, however, several characters, stating that they had no significance; and some of these, in connection with others actually explained by him, have been thought to form a runic inscription denoting the arrival of the Northmen in the present State of Massachusetts several centuries before the Columbian discovery. The translation, as given by Professor Finn Magnusen, of Copenhagen, runs thus:

"151 Northmen under Thornfinn took possession of this land."

Dr. Farquharson says in his article: "As this reading accords almost exactly with the long lost and recently found Saga of Thorfinn Karlsefn, and is accepted by the French runologists, it may be accepted as the true one."

"The confidence inspired by this successful reading," he continues, "induced the Royal Society of Antiquarians of Denmark to purchase this rock, and arrangements were very recently being made to remove it to Copenhagen. The excitement caused by this movement culminated lately in a public meetlng at Boston, and other arrangements were there made by which this important monument of our early history is to be preserved and transported to that city. In consideration of this concession on the part of the Danish antiquaries, a granite monument is to be erected on the spot now occupied by the engraved rock, thus to commemorate the landing here in 1007 of Thorfinn, as narrated in the Saga, and in the inscription, as read by Magnusen."

If such is really the case, the good citizens of Boston may rejoice in the prospect of two grand celebrations with the usual accompaniments of flag-waving, speeches and other proceedings characteristic of such occasions. But would it not be well for them to pause before they carry out their plan of placing a monument at the mouth of Taunton River, and to consider whether the Danish runologist's interpretation can stand the test of scrutiny? If not, they run the risk of commemorating something that probably never happened. It is not surprising that a people to whom, owing to the short duration of its existence, the romantic element of an ancient history is denied, should evince an inclination to acquiesce in the acceptance of a vaguely intimated occurrence to which the character of a historical fact cannot be attributed. Yet such a tendency is totally at variance with the spirit of keen inquiry characterizing our time, and therefore should not be fostered, but should be made to yield to the dictates of sober judgment. I leave for a moment the Dighton Rock inscription, and its interpret-

ation by Finn Magnusen, in order to make some statements concerning *another* attempt of the same gentleman at deciphering runes.

The venerable chronicler, Saxo Grammaticus, gives an account of a great battle fought in Sweden on Braavalle heath, close to the boundary of Oestergotland and Sodermanland. The contest was between King Harold Hildetand of Denmark and the Swedish King Sigurd Ring, the first of whom was slain in the battle which is supposed to have been fought about the year 700 of our era. A runic inscription relating to this battle was said to be engraved on a rock in the Swedish province of Bleking. The rock is called "Runamo" by the people of the neighborhood. The spot was visited at different periods by antiquaries, but none of them attempted to explain the marks supposed to be runes. In the year 1833, however, the Royal Danish Academy of Sciences concluded to send a committee of scientists to the spot, to investigate the subject thoroughly and report with regard to it. Professor Finn Magnusen was a member of that committee. As it would be foreign to my purpose to describe the operations of these gentlemen in detail, I come at once to the point by stating that in 1841 Professor Magnusen published an illustrated quarto work of 742 pages, under the title of *Runamo og Runerne*, the principal feature of which is his translation of the marks on Runamo Rock. He made the following inscription:

Hildekind occupies the empire
Gard cut in (the runes)
Ole gave oath (oath of allegiance)
(May) Odin hallow the runes
(May) Ring fall
On the earth
Alfs, lovegods
(Hate) Ole
Odin and Freja
And Aser's decendants
(May) destroy our enemies
Grant Harrold
A great victory

As will be seen, the purport of the inscription is an invocation against the enemies of Hildetand, whose name, however, is read "Hildekind." The runes, Professor Magnusen states, are of an intricate character, and must be read from right to left. But now comes the reverse of the medal.

In the year 1842, and afterward in 1844, the Runamo Rock was visited for the purpose of examination by the distinguished Danish archæologist, J. J. A. Worsaae—the second time in the company of an artist, who took different views of the locality. Again, I cannot enlarge on Mr. Worsaae's most thorough investigations, but must confine myself to a statement of the final result he obtained namely, *that there is no runic inscription whatever on Runamo Rock, and that the marks considered as runes by Finn Magnusen are simply the natural cracks on the decayed surface of a trap dike filling up a rent in a granitic formation.*

The arguments brought forward by Mr. Worsaae are to me absolutely convincing, and cannot fail to produce the same effect on every unbiased reader who peruses his amply illustrated work on the subject. It appeared in 1844 at Copenhagen under the title *Runamo og Braavalleslaget. Et Bidrag til archæologisk Kritik*

or "Runamo and the Braavalle Battle. A Contribution to Archæological Criticism." The work was translated into the German language under the author's supervision, and published in 1847 at Leipzig as the second part of a highly illustrated quarto volume, entitled *Zur Altertnumskunde des Nordens.* A copy of this translation (perhaps the only one in the United States) is in my possession, and may be inspected by any one particularly interested in the subject.

I should not omit to state that Mr. Worsaae speaks throughout the work in terms of the highest consideration of his colleague, Professor Finn Magnusen; yet his personal regard could not prevent him from exposing the grave error of this meritorious scholar, who allowed himself to be led astray by a too lively imagination.

In view of the foregoing it may be pertinently inquired: What confidence can be placed in Magnusen's interpretation of the Dighton Rock inscription? Any one who will take the trouble to examine in the published drawing that part of the Dighton Rock inscription supposed to be of Scandinavian origin, must perceive at once on what shadowy basis the presumption rests. Even Schoolcraft, who professes to believe that the Northmen sculptured runes on Dighton Rock, could not conceal his scruples as to the correctness of the translation furnished by Professor Magnusen. I may revert to this subject in another article.

The evidences brought forward to prove in a tangible way the presence of the Vikings of the North in the so-called Vinland have certainly thus far been very unsatisfactory. The "Skeleton in Armor" disentombed near Fall River was doubtless that of an Indian, buried, perhaps at a comparatively late period, with some weapons and ornaments made of sheet brass—a material with which the New England settlers are known to have supplied the natives. The "Round Tower" at Newport, Rhode Island, is now considered as the substructure of a windmill, erected during colonial times. For details, I refer to a curious little pamphlet, entitled "The Controversy touching the Old Stone Mill in the town of Newport, Rhode Island," (Newport, 1851). What will be thought of the supposed Scandinavian inscription on Dighton Rock at some future time, when pardonable credulity will have yielded to severer methods of investigations?

All this, however, does not invalidate my belief that the Northmen were pre-Columbian discoverers of America.

—*American Antiquarian.*

JAPANESE ARCHÆOLOGY.

Japan has an active archæological society bearing the title of Kobutzu Kai (Society of Old Things). Its members, numbering 200, are scattered throughou the land, but meet once a month in Yeddo. They consist chiefly of wealthy Japanese gentlemen, learned men, and priests; the latter especially have been the means of bringing before the public attention a vast number of ancient objects hidden in the treasuries of the temples or preserved in private families. H. Von

Siebold, attaché of the Austrian Embassy at Yeddo, and a member of the society, has lately published a *brochure*, which will serve as a guide for the systematic archæological study of the land; Von Siebold has lately made a most interesting discovery of a prehistoric mound at Omuri, near Yeddo, containing over five thousand different articles in stone, bronze, etc. In a recent communication to the Berlin Anthropologische Gesellschaft, he describes the origin of the terra cotta images found in old Japanese burial grounds. It appears that up to the year 2 B. C. it was the custom to surround the grave of a dead emperor or empress with a number of their attendants, buried alive up to the neck, their heads forming a ghastly ring about the burial spot. At the date referred to the custom was abolished, and the living offering were replaced by the clay figures which have hitherto attracted so much attention.—*Nature.*

DESCRIPTION OF SOME INTERESTING STONES FOUND IN CLEONA TOWNSHIP, SCOTT COUNTY, IOWA.

BY REV. J. GASS.

A number of remarkable stones, with ancient engravings, are imbedded in a creek about twenty-two miles west of Davenport. I visited the place twice to obtain the needed information and help for the exploration. The second time, *i. e.*, on the 15th of May, I discovered five inscribed stones. Two of them are now in our Museum, and the other three, even if I had the power to move them out of the creek, would have been too heavy for my vehicle, though one of them, the largest and most important, covered with many inscriptions, might be of particular value to our Academy.

Some other stones of more or less importance will, perhaps, be found there when the water in the creek is lower.

Now, the whole group of stones, except the largest one, is below the surface, and it was only by several hours of arduous labor that I could accomplish what I have already done.

For a further exploration, I have obtained from the kind owner of the farm, a written permission, and with the assistance of the Academy to hire some help, I shall be able to obtain possession for our Museum of some more of these relics, so valuable for investigation and comparison, and to gain additional facts for a second and more detailed report.

—*Davenport Academy Report, 1877.*

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REPORT OF EXPLORATION OF MOUND NO. 10, COOK'S FARM GROUP.

BY REV. J. GASS.

Having recently explored another mound of the Cook Farm Group, near Davenport, I would respectfully present the following brief description of it:

This mound, which we will designate as Mound No. 10, is situated in the second or northwesterly row of mounds, and is ninety-five feet northwest of Mound No. 1, and one hundred feet northeast of Mound No. 5. It should be mentioned that these mounds have been numbered in the order of their exploration, and without reference to their relative position. Mound No. 10 is the smallest and least important one of the group. It was about fifteen feet in diameter, and about eight inches above the surrounding surface. All the mounds in this row, viz: Nos. 7, 5 and 10, are less elevated than those of the other line. Six inches below the surface I found a pile (or altar?) of stones, which were packed closely together throughout, and although of irregular size and form, they were so arranged as to present a tolerably even surface on each side of the pile, which was three and one-half feet long from east to west, and two and one-half feet from north to south, and two and one-half feet high. The whole pile rested upon the high, undisturbed clay at the bottom of the excavation, and three feet above the surface of the ground. The excavation was about ten feet long from east to west, and six feet wide, rather more than two feet deep, and rounded at the corners and bottom, being of the same form as those already described in Mound No. 3. The mound was three feet in depth, from the surface to the hard clay at the bottom of the excavation. In the lowest layer of the pile was a flat stone, two feet long, ten inches wide, and about two inches thick, lying with the smoother side downward. Beneath this stone I found fragments of the leg bones of a human body, pressed down into the clay. About two to two and one-half feet west from this pile, and one to one and one-half feet below the surface, was a small layer of the usual river shells, about three feet long from north to south, and two and one-half feet wide and one inch thick. This layer was in an arched form, the north and south edges being curved downward. The shells were much decayed, and not a single one could be preserved. Three or four inches below this shell layer, and directly under the middle, were several fragments of pottery, evidently comprising not nearly all of the original vessel, and three small polished stones. The pieces were nicely packed together in a little pile, showing clearly that they were thus broken before being placed there. No farther indications of relics or human bones could be discovered.

The articles above named are in the cabinet of the Academy, and although but few relics were obtained, the observation of the structure and arrangement add something to our knowledge of the subject, and especially of this very interesting group.

—*Proceedings of the Davenport Academy of Science, 1877.*

PROCEEDINGS OF THE KANSAS STATE ACADEMY OF SCIENCE.

SEMI-ANNUAL SESSION, AT KANSAS CITY, MO.

REPORTED BY PROF. J. D. PARKER, KANSAS CITY, MO.

On the invitation of the Kansas City Academy of Science, the semi-annual session of the Kansas State Academy of Science was held in this city Thursday and Friday, June 6th and 7th. The members present were: Profs. B. F. Mudge, Frank H. Snow, G. H. Collier, F. W. Bardwell, George E. Patrick, James Marvin, Judge F. G. Adams, Joseph Savage and wife, J. A. Lane, Frank O. Marvin, E. A. Popenoe and wife, Mrs. F. W. Apitz, F. B. Ashton, Judge Hutchins, Hon. G. A. Crawford and Gen. Halderman; also, Prof. G. C. Broadhead, from Pleasant Hill, Mo., as a visitor, and several citizens of Wyandotte and other neighboring towns.

Col. Van Horn, president of the Kansas City Academy of Science, called the meeting to order and gave the opening address. He said:

Mr. President and Gentlemen of the Kansas Academy of Science:

When our young society first thought of asking you to meet in our city we scarcely dared to hope for the honor. Not because of your indisposition, but that your rules might forbid. We were more than gratified to find it was not so, and we are honored beyond our deserts in your acceptance and presence here among us.

Science is the noblest, as well as most delightful, of human pursuits, and its followers, next to its teachings, delight in conferring benefits upon its disciples. It is to this that we owe your acceptance of our call. It was your example and one of your number that led to the formation of our society, and we desired above all things to have the opportunity to meet with and learn of those who have made the Kansas Academy of Science an institution of such wide usefulness, and given it a reputation that is more than national.

We are here to be your servants and your pupils, and it will be one of the memorable events of our history that you have opened for us our second year. Our Academy has been most fortunate —it was inaugurated by the distinguished astronomer of England, Richard A. Proctor, and now our second year opens under the auspices of your, to us, venerable society, in the discussions and transactions of one of its regular meetings. If, then, your visit among us brings to you in even a small degree the satisfaction it affords to us, we shall be amply rewarded. In the name, then, of the Academy and of the whole people of Kansas City, I give you a cordial, and as far as we can make it so, a hospitable welcome. This edifice, our services, and all that we can do to further your

wishes, is now at the service, Mr. President, of yourself and your associates. All is in readiness, that you may proceed to the duties that have called you together.

Col. Van Horn then introduced Prof. Snow, president of the Kansas Academy of Science, who responded, in substance, that it gave the scientific men of Kansas the utmost pleasure to accept the kind invitation extended by the Kansas City Academy of Science to hold their semi-annual meeting in Kansas City. We live in different States, but scientific workers cannot be separated by State lines. Kansas City, sustained vital relations to his State; indeed, he thought it ought to be in Kansas. At the annual meetings their papers were more strictly of a scientific character, but at the semi-annual meetings the proceedings were of a more popular character. Members discussed facts coming within their observation since the last meeting, or made scientific excursions. He was glad there was one planned for the morrow to the mounds of Clay county. They would report at night after their return, giving their observations. These mounds, sometimes, were very rich in the remains of the prehistoric races. He trusted the present meeting would be interesting and profitable to all concerned, and bind the scientific men of Kansas City and Kansas more firmly together.

Prof. Mudge was then introduced, who gave an interesting lecture on the "Rocky Mountains and their Fossils." He first explained the general principles underlying the formation of mountains. Mountain ranges are wrinkles in the earth's crust resulting from the condensation of the interior or melted portion, leaving it to wrinkle or be thrown up in ranges, as the flabby cover too large for the ball would contract, forming wrinkles. The lowest mountains are, therefore, the most ancient. The Laurentian mountains, in Canada, are the most ancient on this continent. The Professor then gave a sketch of the mountains east of the Mississippi. The Rocky mountains are the youngest of the family on this continent.

Mountain making was a gradual process. Perhaps the Alleghany system was a million years in their formation. Visiting the Rocky mountains we find sometimes the rocks tilted up until they stand on their edges. These blocks were once horizontal, lying beneath the primal ocean. The speaker then cited instances where rocks of the Jurassic and Triassic age were tilted at various angles, while the Cretaceous rocks were horizontal. In or near the South Park there is a small valley four or five miles long and half a mile wide, containing a fossil forest. The trees have mostly disappeared, leaving the stumps. The trees were once probably immersed in a warm stream charged with silica. Prof. Mudge found insects fossilized as perfect as life, and once he found a fossil butterfly. These insects could not live there now, therefore the climate must have been warmer.

The lecturer then gave an interesting account of the formation of Pike's Peak and the neighboring mountains. He showed the mountains had subsided 15,000 or 20,000 feet and then been raised to their present position. He saw shells of the Potsdam formation found 1,400 feet above the sea level.

The speaker then gave a theory to account for the great natural parks in Colorado.

The closing portion of the lecture was devoted to the fossils of the Rocky Mountains. These monsters of ancient geological times have been wonderfully preserved. He found dinosaurs which would measure 70 feet in length, and hold their heads 30 or 35 feet from the ground. Beds of lava were found that had extended 40 miles in length. The lecture was replete with information and held the audience with fixed attention to its close.

On the second day the members of the Kansas Academy of Science, accompanied by the members of the Kansas City Academy, made an excursion to the mounds on the north side of the Missouri river, the party, including several ladies, numbered over thirty. These mounds, the remains of a *prehistoric race*, are situated on a crest of a high ridge about a mile from the Missouri, near Line creek, on the Platte side of the line between that county and Clay, and about five miles from Kansas City. They are found all along the line of bluffs as far east as Randolph. One peculiarity of these mounds is that nearly all, so far opened, contain a stone walled chamber, from 7½ to 8½ feet square, with an entrance about 2½ feet wide. The walls are about 3 feet in height. In all of them, so far opened, there have been found human remains, flint implements, and in some cases pottery. Three were opened, but only two of them were fully explored. Eleven skulls in all were found, together with other bones, teeth and jaw bones containing the teeth. But few flint implements were found, and no pottery. Some of them, heretofore opened, contained evidences of fire having been used in them. The skull bones exposed to the air crumbled very much, but one was secured in a very good state of preservation. Some of the teeth were remarkably perfect, as were the toe bones, and some others.

Profs. Mudge and Broadhead were both present superintending the operation. One skeleton was uncovered almost perfect, but the bones were too brittle to be saved entire. The heads were all found next to the walls, showing that they had been regularly laid away, but the bones were scattered—some of them showing unmistakable evidence of being gnawed by some animal. These, with the fine state of preservation of most of them, led to the supposition that part of the remains must have lain above the ground for some time and dried, and afterwards gathered and entombed with the others. It is a well-known fact that rodents do gnaw dry bones, squirrels being seen doing so. All these facts taken together—the small size of the stone chambers, the absence of anything of what might be articles of personal use, buried with the owners, and the gnawed bones—led to the conclusion that they were places of sepulture only, and that those who used them lived in habitations adjacent of less durable material. The location of the mounds is very regular, and every one of them has an outlook on the Missouri and the Kaw Valley—the view from them being one of the finest, as to landscape, to be had from any point for miles around. The day was cool and pleasant, and the excursion passed off to the satisfaction of everybody, and our guests were delighted at the success of their undertaking.

On Friday evening a large andience gathered in Dr. Bell's church to hear a lecture from Prof. Bardwell on Navigation, and to hear the report of the excursion to the mounds. Prof. Bardwell being introduced, said:

A short time before the close of the college year, I was invited to prepare a lecture for this occasion, and without much reflection, accepted the invitation. Under the most favorable circumstances you could not well expect an eloquent address from an engineer. Scientific men occupied with the study of nature, as for instance the botanist or geologist, naturally become eloquent. Their labors take them into the broad fields of nature, where they gather inspiration from labor and all their surroundings. Eloquence becomes with them a habit, and they are ever ready to speak out in the fullness of their enthusiasm. Of this we had a pleasant illustration. On the other hand, as the chairman informed you, the engineer is very practical. He is occupied chiefly, not with organic, but inorganic nature, with raw materials—perhaps with piles of sand and mortar, or estimating the strength of a retaining wall, supporting an embankment, or it may be busied with a series of mathematical formulas. Now there is nothing soul-inspiring in the contemplation of a bed of mortar, or even in an array of mathematical symbols; there are no crystals of wit found incrusted in a bed of concrete, and if the engineer by manipulating cement causes it to harden in water, you need not be surprised to find that even with a wet subject he is able to produce a dry discourse

It is clear that I should not have accepted the invitation to appear here at this time, but there was one greater mistake made before that, that was in giving me the invitation. This was the fault of our chairman. I hope you will forgive him this time, and I am sure he will promise never to do so again: It was announced that my subject would be "River Navigation," but a glance at the general subject, it seems to me, is really needed to make that consideration satisfactory. The history of navigation is useful for the practical lessons which it teaches; but it also possesses an interest for the general student, on account of the close relation which has ever been found to exist between skill in navigation and a high degree of civilization. Looking back in the dimmest vistas of ancient history, we catch glimpses of that curiously interesting people, the Phœnicians, remarkable for their exploits on the sea, and as remarkable for the high state to which they carried the arts of civilization. In language and lineage the ancient Hebrews were closely allied to them, and we read that Hiram, king of Tyre, sent a skillful artificer to do the finest work for Solomon in finishing his temple. This was about a thousand years before Christ. They must have been a flourishing people long before that. The present city of Cadiz, in Spain, was founded by a colony of Phœnicians more than 3,000 years ago, that is about 200 years before the time of Solomon, and it is probable at that early day they sailed out into the Atlantic and visited Great Britain for the purpose of obtaining zinc and tin.

They had a knowledge of arithmetic and astronomy, which they used in navigation. From them Greece received their alphabet, learned the rudiments of arithmetic, as indirectly have all the nations of Europe. Here let me digress for

the moment to say that arithmetic is, of necessity, the oldest of sciences, older even than astronomy, and I have explained elsewhere that this fact in some measure accounts for the crudeness that even yet points to the elements of this science, so essential to the wants of men in all ages and in all degrees of civilization.

At a later day the Greeks learned the art of navigation, and it is possible that the ancient mariner of the Greeks, Jason, who led the Argonautic expedition, owed his skill directly or indirectly to the Phœnicians. The Greeks became distinguished for their commerce as well as for their culture. A historical writer says:

"It is noticeable that Athenian commerce was at its highest at the same time that Athenian genius was most prolific in philosophy, poetry, history, oratory and the fine arts."

I will merely mention as a later illustration of this intimate relation of commerce and civilization, Venice, and in our own day, England. It was Raleigh who said, "Whosoever commands the sea commands the trade of the whole world, who commands the trade, commands the riches of the world and the world itself." Here let me remark that in her recent negotiations with Russia and the powers of Europe, England astonished many by her success, when it was supposed the Russians had made themselves masters of the situation and were able to dictate their own terms. English supremacy is by no means a thing only of the past. Her right hand has not yet lost its cunning.

The first great advance of modern times in the art of navigation was made when the mariner's compass was made available. The Chinese, before the Christian era, knew the polarity of magnetic iron, and, placing bits of it upon pieces of cork floating on water, were able to determine direction It is said that Marco Polo brought a knowledge of this to Italy in 1260 and it was known in France still earlier, and indeed in other European countries. But a Neapolitan, Flavio Gioa by name, was the first, it is believed, to devise a construction like the present mariner's compass which could be used by the ordinary seaman. This opened a new field to commercial enterprise, soon led to the discovery or rediscovery of this Western world, and indeed, entirely changed the course of the world's history.

Yet even after the introduction of the compass, the mariner had many difficulties to contend with. Mercator's chart was of great value in helping to avoid some of these, and the quadrant, or in the form now used, the sextant, became invaluable. The simplicity, the convenience and accuracy, add to these improvements in tables, resulting from the progress in astronomical science and the use of logarithms in computation, with improvements in naval constructions, and we reach the ultimatum obtained in the art of sailing. In this branch of the subject let me detain you but a moment longer. It is now a little more than one hundred years since Maskelyne issued the first nautical almanac under the direction of the British, and it has appeared without interruption every year since The American nautical almanac appeared for the year 1855, and continues without interruption. The almanac furnishes those astronomical facts and computations which are of the highest importance to the mariner even of to-day. I wish especially to call your

attention to the fact that in this way the science of astronomy has served a most important part in the progress of modern civilization.

A second great advance in the art of navigation was instituted by the successful application of steam to the propulsion of boats. Of course the name of Robert Fulton first occurs to the mind. The history of his efforts to inaugurate steam navigation would of itself furnish ample material for the evening's lecture. A glance at a few salient points must suffice our present purposes. In the first place, he was not the original deviser of a boat propelled by steam power. This had been the object of effort in England and France, as well as in this country. In fact, Fitch had constructed a skiff to run by steam, and another small boat that moved at the rate of seven miles per hour. But no satisfactory result had been reached whereby profitable use could be derived from the steamboat. Fulton had passed some years in France and England and was familiar with all that had been attempted there. He also gave a great deal of time to the invention of a submarine torpedo, and it is probable that he was the original inventor of this machine, though he never made it completely successful; but he never doubted that success was possible, and as his mind became engrossed with the other problem, that of propelling boats by steam, he gradually neglected the torpedo. He was successful in enlisting the interest of prominent men in his undertakings, and his views attracted attention from such men as Pitt and the Earl of Stanhope in England, and Jefferson and Madison in this country.

While in France he made the acquaintance of Chancellor Livingston, then U. S. minister to that government, and on their return to this country, Livingston joined with Fulton in the effort to make steam navigation practicable. Previous to 1807 Fulton had succeeded in propelling boats by steam, but it was not till that year, that having completed the Clermont, it was admitted that actual utility had been gained.

A committee of the great exhibition in London of 1851 had occasion to refer to this matter, and reported as follows: "Many persons in various countries claim the honor of having invented small boats propelled by steam, but it is to the undaunted exertions and perseverance of the American Fulton that is due the everlasting honor of having produced this revolution in naval architecture and navigation. With his inventive genius he possessed versatility of talent, and showed a marked degree of artistic power. He is described as having been "slender of person, above the ordinary stature, with large dark eyes and features of manly beauty." In enlisting capital and official influence in behalf of his projects, he exhibited uncommon tact, energy, patience and enthusiasm. He had the manners and address of a gentleman. It is seldom that one in private life obtains so great a degree of personal popularity, and his death was mourned as a national calamity.

Since the time of Fulton great improvements have been made in various ways in the carrying capacity and in the speed and efficiency of boats inaugurated on the rivers; it soon extended to the ocean, and to-day few realize the extent to which steam navigation enters as a potent factor in the affairs of all civilized people.

The construction of wheels has perhaps received more study from inventors than any other feature of the steamboat. The amount of ingenuity that has been expended in this one problem, as shown by records in the patent office, seems scarcely credible. In many cases, the screw, as a means of propulsion has taken the place of the side wheel, especially on the ocean. At present the advantages of either do not greatly overbalance those of the other, but in ocean navigation the screw is gaining in favor. With regard to the screw, I should say it did not at first receive favor from practical men as distinguished from scientific men. I shall have occasion to refer to this again.

Before taking up the consideration of a wheel which I have to show you, I ought to allude to the importance of developing river navigation. But probably your attention has been called to this, and a passing allusion is all that is needed.

I believe, however, that few realize the extent of the navigation of the Mississippi river system, including all its navigable tributaries. It is said there are fifteen hundred miles of such branches below the mouth of the Arkansas, and when we think of the great branches above this point, together with the smaller branches, secondary to these, we must truly admit that the improvement of the Mississippi and its branches has better claims to be regarded as of National importance than is possible for any single harbor improvement on the sea coast.

Before leaving this part of the subject, let me refer to what seems to be a wise policy on the part of the railroad management in the transportation of produce from the West to the East. The farmers of Kansas complain that the railroad companies make a close calculation of what amount less than the market price at the East, say for corn, may be charged, so that the farmer can barely live, yet without making any profit. The fact is, if the freight companies should put down freight prices very low, the farmers would expend their energies in raising and shipping corn, and soon exhaust their fertile plains. By a wise dispensation of Providence they are discouraged from this by the management of the railroad companies, and at the same time are led to engage in stock-raising and fruit, which do not exhaust the resources of the soil.

At this point Prof. Bardwell exhibited some diagrams and models illustrating water wheels. Navigators desire to increase the speed of vessels. Fishes move at great speed. Porpoises swimming beside vessels dart out some distance and return without falling behind the vessel. Steamboats sometimes make a spurt at twenty-five miles an hour, others make twenty, fifteen or twelve miles an hour. Why cannot vessels move as fast as fishes? There are several defects in the common paddle wheel by which it loses power. The paddles sometimes lift the water and are made feathery to avoid this defect. The paddles strike the water and displace water. In all displacement of water there is a loss of power. The common paddle pushes the water and thus propels the boat. This wheel (of which this is a model) is a traction wheel. In an experiment made it was agreed that it worked better than the common paddle wheel. The common paddle wheel is a heavy wheel, loads the boat and causes the boat to draw more water. In this respect the traction wheel is superior.

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Prof. Mudge then gave an account of the excursion to the mounds. He said in substance that about thirty went out to the mounds. He thought the mounds might have been some higher than at present, and kept up for a time by new earth. In the first mound we found four skulls. One skeleton lay out extended, the head resting on a stone. It measured about five feet ten inches. The bones of one indicated a height of six feet two inches. We only found one spear head, which measured about six inches in length and two in width. It was unfortunately broken by the spade. In one of the vaults was found a stone wall laid up as nicely as could be done by a stone mason. The stone was brought from a quarry about three-fourths of a mile away. These cysts had entrances from the south. In the last vault were found the most remains. There were two floors of flat stones. In this there were found *eight skulls*. The bones had been gnawed by some wild animals. The bones may have lain on the ground until the flesh disappeared, and then they were buried in the vault. The Cheyennes often do this. Some of the skulls showed good intellectual development, and some were quite low. In one of the mounds we found charcoal and evidences of fire in the shape of clay burnt red.

We know from the remains of the Moundbuilders something about their character. They were something in advance of the North American Indians. Probably they were the progenitors of the Toltecs. Their pottery was made by constructing a grass basket of the shape of the vessel. After the vessel hardened the grass basket was burnt off. The copper mines of Lake Superior were worked by the Moundbuilders. They took out more ore than we have taken out in forty years. They cultivated the ground. They wove cloth as fine as twelve strands to the inch. They worked mica. This race covered a large part of the Mississippi valley. Here the professor displayed the skull of a Moundbuilder. It seemed to be of a rather savage man. Prof. Snow stated that on one of the mounds was a stump having two hundred rings. Judge Adams read an extract from Rev. Isaac McCoy's account of Indian Missions in the West showing that mounds have been discovered in Kansas.

Prof. Snow then gave a laughable incident connected with the recent excursion, indicating that the present meeting was not devoid of subjective tendencies on the members. After thanking Kansas City for the rich treat afforded them, inviting the members of the Kansas City Academy of Science to attend their next annual meeting, and declaring the present semi-annual meeting a success in every respect, he declared the meeting adjourned.

After the adjournment Col. T. S. Case exhibited a number of photographs showing the effect of the Richmond cyclone upon that city, which were examined with decided interest. He also presented for inspection a specimen of the solid hoof of the new species of Texas hog, which has produced so much discussion among scientific men. Much interest was manifested by the members in this specimen, some claiming it as an evidence of evolution, and others, notably Prof. Mudge, declaring it to be nothing more than a somewhat persistent monstrosity.

ASTRONOMY.

A MANUFACTURED COMET.

The work of making astronomical observations is about the most laborious and trying in which an intellectual man has ever to engage. Any difference of temperature between the air which surrounds him and that outside would be fatal to the accuracy of telescopic vision; so that no matter how cold the night may be, not only must no artificial heat be allowed him, but he must take special pains to have his observing-room as cold as the outer air. He must sit perfectly still, his attention concentrated upon the object which he is scrutinizing. Gloves can hardly be allowed him, because they would interfere with the delicacy necessary in handling his instrument. And whether it be warm or cold, he must pursue his avocation during the hours when the rest of the world are enjoying themselves in sleep. If he wants to discover a comet, he will find the search as trying to his patience as the observations are detrimental to his physical comfort. He may scan the heavens with unwearying assiduity on every clear night during an entire year, and yet not be rewarded with a single discovery.

All this the Chevalier d'Angos learned from sad experience. This gentleman was one of the famous Knights of Malta, during the latter half of the last century, and being imbued with an astronomical taste, had built himself a small observatory, or perhaps got it built by the brotherhood. He was known in the astronomical world as the computer of cometary orbits at a time when such computations were much more difficult than they are at present. But up to the time when our story commences, although he had made a few observations with his telescope, he was not known to have made any discovery whatever. It was in the year 1784 that a happy thought struck the ambitious knight, the development and results of which form the principal subject of our story. In May of that year, Messier, of Paris, celebrated as the discoverer of comets, received a letter from D'Angos stating that he had discovered a small comet without any tail on the night of April 11th. At first he supposed it to be a nebula. Still, in order to make sure of it in case it should prove to be a comet, he had carefully fixed its position among the stars.

Two or three cloudy nights followed, when he found it again, and saw that it had moved several degrees. He now knew it was a comet, and therefore communicated his observations to the Paris astronomer. In the following month the observatory at Malta was destroyed by fire, with, as was supposed, all its papers. It was therefore feared that this was the last of the comet. In those times it took a month for a letter to reach Paris from Malta, so that when Messier heard of the discovery it was too late to find the comet. But a couple of years afterward there

appeared in a mathematical journal published by the celebrated Bernulli a series of observations on the comet by D'Angos, extending from the 11th of April to the 2d of May; also a set of elements, supposed to be derived from the observations, showing in what orbit the comet moved around the sun. D'Angos added that the elements represented the observations with almost entire exactness. So far there was nothing at all to excite suspicion; but when mathematicians came to scrutinize these observations more closely, they were not only unable to reconcile them with the orbit given by D'Angos, but, in fact, with any orbit whatever. No heavenly body had ever been known to move in an orbit so erratic as that which the observations would indicate, while the orbit assigned by D'Angos would have placed the comet in a quarter of the heavens entirely different from that in which he professed to have observed it. Evidently there must be some mistake in the numbers given by the Chevalier. But it was impossible to correct them in such a manner that the corrected orbit would represent the observations. The nearest approach that could be made was to suppose the comet so near the earth as almost to move around it like a satellite. A suspicion that the whole thing was a fabrication now began to gain general credence. But beyond the seeming impossibility of representing the observations, no proof of the fabrication could be afforded. When the observatory was burned, all the papers were burned with it, so that it was impossible to refer to the original records. No one else had seen the comet, but then D'Angos himself said it was a very faint one; consequently it might well have escaped notice. Finally, if the observations were entirely fabricated, it would be supposed that the Knight would take good care to have them correspond to the orbit which he had marked out, whereas, as we have said, there was no such correspondence whatever. What made the thing still more inexplicable was, that D'Angos understood perfectly the art of computing cometary orbits as then practiced.

Thirty years passed away, and D'Angos was dead and gone before any new light was thrown upon the difficulty. The comet still figured among the discoveries of that year, but no one had explained the observations. Olbers, about 1820, subjected the latter to a new examination, and, like others who had done so, was led to the conclusion that no comet could have moved in the manner in which D'Angos pretended to observe it. The only explanation seemed to be that he had assumed some orbit, calculated how the comet would appear from the earth if it moved in that orbit, and then pretended to have observed it in the calculated positions, but that in making his calculations some mistake had crept in. Olbers asked Encke to take up the subject and see if he could meet with any better success in explaining the matter. Encke satisfied himself, as others had done before him, that it was impossible to represent the observations by any admissible orbit. At length, after many trials, he took the orbit of D'Angos and sought to find in what way it would have to be changed to represent the observations. The clew to the whole forgery was at length reached. Take this orbit, but multiply all the distances of the comet from the sun by ten, which merely involves a mistake of one figure in a certain logarithm, and the observations are all repro-

duced pretty much as D'Angos gave them. The mystery was then solved. The Chevalier, anxious to figure as the discoverer of a comet, had imagined this orbit; supposing the comet to move in it, he calculated the positions in which it would appear from the earth; but by one of those accidents which so frequently happen to the dishonest, he had made a mistake of just one figure in the number representing the distance of the comet from the sun, and thus not only completely spoiled the result, but left concealed in his numbers the key which was to lay open his forgery long after he should be dead.—SIMON NEWCOMB, in *Harper's Magazine for June.*

THE TOTAL ECLIPSE OF THE SUN.

On the 29th of July next a total eclipse of the sun takes place under such circumstances as to present opportunities that occur scarcely once in a generation for the study of some of the most interesting phenomena with which astronomers have to do. The path of the totality of this eclipse runs diagonally across the center of the United States from Montana to Texas, and is somewhere about 140 miles wide. Many of the best points for observing the eclipse are therefore directly accessible by railroad and several expeditions might be sent out fully equipped to as many different points, without spending so much money upon them as it would ordinarily take to equip a single expedition to a more distant point.

Recent discoveries have rendered it probable that most of the meteorological changes upon this planet are caused by events taking place upon the sun, and many questions relating to the physical constitution of that orb and the changes there taking place can only be studied during a total eclipse. It is said by Admiral Rodgers, of the Naval Observatory, that the sum of the opportunities which all the astronomers of the world can get for observing such eclipses does not exceed five or six hours in a century, and it is therefore important that every advantage should be taken of the very favorable conditions for observation under which the present eclipse occurs. All the principal European governments recognize the importance of studying the phenomena attendant upon the total eclipses, and send out costly expeditions, even to the antipodes when necessary, for this purpose, and there is no doubt that there is a general impression abroad that our government would make ample provision for the study of a matter of such general interest, that is visible almost exclusively within our borders, or the different foreign governments would no doubt be preparing to organize expeditions for observation on our territory. Our government, however, has so far done nothing, and it is possible that one of the best opportunities that may occur in many years for the study of solar phenomena may pass away without any advantage being taken of it.

The Naval Observatory is awake to the importance of the occasion and has asked Congress for an appropriation of $8,000, for the purpose of sending off seven expeditions, two of which it is designed to send to Montana, two to Texas,

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two to Colorado and one to Wyoming, each to consist of three astronomers. The sum asked for was simply to pay traveling expenses and the cost of transporting and setting up the instruments in their temporary observatories, nothing being requested for salaries, as the most eminent astronomers will gladly volunteer their services for such an important occasion.—*Scientific American.*

AGRICULTURE AND HORTICULTURE.

FOLIAGE PLANTS FOR WINDOW CULTURE.

BY MRS. R. B. E. MELROSE, MASS.

Premising that among the readers of the *Monthly* there are some who like to turn aside from the beaten track, wherein grow Callas, Geraniums, Abutilons, &c., to "rarer fields and pastures new," I give herewith a brief sketch of my success with some of the less commonly grown window plants. And for ease of culture and showiness of foliage, I consider the Croton at the head of the list. I have a Croton interruptum, which I bought of Mr. Saul one year ago last May, then a very small plant, and to-day it is thirty inches high by as many broad, finely branched and richly colored. I do not, however, think interruptum nearly as handsome as some of the others; indeed, pictum, though an old variety, is more showy. I have one of the last, which is very lovely, with its gold and crimson markings. Of the new varieties, Youngii, Veitchii and Undutaltum are splendid species. In my opinion the latter is the prettiest, though all are magnificent. Crotons require strong sunlight, and the warmest place at command. I shower mine daily with warm water, and keep them on the highest shelf; and they well repay this slight care with their brilliantly-colored leaves, more ornamental, I think, than flowers. Dracænas are also both ornamental and easy of culture, and give a nice look to a stand of plants. But for a north window, and a cooler location, I think Aspidistra variegata the finest thing I have ever tried. I have one that has over thirty of its long, broad, glossy leaves, from four to six inches across, each elegantly striped with white, and gracefully recurved. It is never troubled with insects of any sort, and ought to be more often seen than it is. It requires a liberal supply of water, both over the foliage and at the root. Of rarer plants, I have grown with good success Palms, Pandanus, Marantas, Tillandsia and Dieffenbachia maculata, the latter an especially fine, free-growing plant, with broad green leaves, prettily spotted with white. It is recommended for wardian cases, but I have had no trouble with it in my sitting-room. Of course these more delicate plants require thought and care in their treatment, but they amply repay the extra trouble by the elegant effect they give to a stand of blooming plants. I think we might grow many more of what are classed as

"stove" plants in our rooms, by proper attention to cleanliness, and moisture in the air. In addition to water on the stove, I keep large sponges, constantly wet, lying among my plants. I have, in this room, a Maiden-hair Fern, which has thrown up between thirty and forty fronds, some of them two feet high, and the mass more than that across.

I will stop to mention but one blooming plant, as this article is already too long. One year ago last spring, in looking over Mr. Saul's catalogue for something new for winter blooming, I came upon the Rogiera. I sent and got one by way of experiment. And I wish to testify my extreme satisfaction with this pretty, fragrant plant. The variety I had, bore pinkish-white flowers, in heads like the Bouvardia, only the clusters were three times as large, and the fragrance is peculiar and exquisite. In needs heat and sunshine, and grows freely without trouble.—*Gardener's Monthly.*

HOT WATER AS A RESTORATIVE FOR PLANTS.

M. Willermoz, in the French "Journal of the Society of Practical Horticulture," relates that plants in pots may be treated with hot water when out of health, the usual remedy for which has been repotting. He says that when ill health ensues from acid substances contained or generated in the soil and this is absorbed by the roots, it acts as a poison. The small roots are withered and cease their action, consequently the upper and younger shoots of the plant turn yellow, and the spots with which the leaves are covered indicate their morbid state. In such cases the usual remedy is to transplant into fresh soil, clean the pots carefully, secure good drainage, and often with the best results. But the experience of several years has proved with him the unfailing efficacy of the simpler treatment, which consists of watering abundantly with hot water at a temperature of about 145° Fahrenheit, having previously stirred the soil of the pots so far as might be done without injury to the roots. Water is then given until it runs freely from the pots. In his experiments the water first came out clear, afterwards it was sensibly tinged with brown, and gave an appreciable acid reaction. After this thorough washing the pots were kept warm. Next day the leaves of two Ficus elastica so treated ceased to droop, the spread of black spots on the leaves was arrested, and three days afterward, instead of dying, the plants had recovered their normal look of health. Very soon they made new roots, immediately followed by vigorous growth.

MARECHAL NIEL ROSE.

This magnificent rose is not so generally cultivated as it merits. In many gardens there is not a respectable looking plant of it to be found, and in others it is not grown at all—an omission for which nothing else can compensate. When grown in pots or restricted as a dwarf or standard among others in the open air

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it has no chance of developing its true qualities, and those who only grow it in those ways may just as well not grow it at all. To grow it in all its magnificence it must be planted out in a greenhouse or conservatory, and the branches be allowed to grow to their fullest extent. It is then that armsfuls of splendid golden blooms are produced and their great loveliness is fully displayed.

There is no plant in existence that will produce such a quantity of valuable flowers as a Marechal Niel rose, properly grown—and by growing it properly I do not mean that great attention must be paid to it; this it does not require. No plant under glass requires less attention, but what it does have must be of the proper kind. I think there are only two important points in the cultivation of this rose which must have the best attention: the one is give it plenty of nourishment at the root, and the other is to let the branches extend as much as possible, or at least convenient. A very favorable position is not necessary to its well-being. Back walls and low walls are positions where it will thrive. It may also be grown upon pillars or on roofs, but here it is then liable to shade plants underneath.—*Journal of Horticulture.*

MISCELLANY.

EXPENSE OF A TRIP ABROAD.

Since my return from Europe a large number of persons who contemplate a visit to the Paris Exhibition during the present year have desired me to give them some idea of the probable cost of the journey. To each one a uniform reply has been given, and the first words were, "You can make it cost just what, in reason, you like." And it is so. A man can spend a $1,000 in a month's travel, and another can suit himself just as well for one-fifth the money. My own experience, based on a ten day's visit to Paris during the Exposition of 1867, is that you can live remarkably cheap in that delightful city. During my visit in January last to the capital of France, I was careful to inquire as to the probability of an increase in hotel rates. The answer was there will be none. The Grand Hotel Bristol is a magnificent house in every respect, and for such a place the charges are remarkably reasonable. At that place a handsomely furnished, well-lighted room cost me six francs, $1.20 per day, and a dinner, including *vin ordinaire*, a similar amount. But, as in London, the better plan is to take your meals out, as the French people generally do. For ten francs (2) per day a man can live well. But to give a clearer idea of the total cost of such a journey, it may be as well to start out with the theory that we propose to be absent two months or sixty days. Eighteen days of this will be upon the ocean and for the round trip the cost need not be more than $120. On arrival at Liverpool, the docks and other places of interest have to be seen, which will occupy two days, the cost of living per day

being ten shillings, with four shillings added for omnibus and cab fares, $7 ; from Liverpool to Manchester, where two more days are spent at the same rate ; then directly to London, the fare being $5, occupying a portion of one day. In London, there is a multitude of sights of interest to be looked up. There is the Crystal Palace, British Museum, Alexandra Park, Zoological Gardens, National Gallery, House of Parliament, the Tower of London, etc. Here, to do the thing up in any kind of a way, a sojourn of at least ten days should be made. This involves an expense of $30 for living, (it can be done for less, and well done too), and an additional $7.50 for omnibus hire. Then comes the trip to Paris. The return ticket from London to Paris will be, in American money, $18.75, and which is available for one month. The journey to Paris usually occupies from ten to eleven hours, so that one full day may be allowed in going and coming. Then a stay of fifteen days should be made in Paris, and the visitor, if he be prudent, can do admirably as far as lodging and living upon $2.75 per day, or $41.25 ; and adding to this ten days to the Exhibition, one franc each time, brings $3.25, with $10 added for conveyances, brings Paris to cost $53.25. During this time, if disposed, a trip can be made to Geneva Lake at a cost of $15. This brings us back to London, with eleven days to spare. A trip to the Isle of Wight, a run to Scotland, and thence down through Ireland, joining the steamer at Queenstown, can be easily done at an average cost of $7 per day—a total of $77—and then we find ourselves on board the steamer again, without anything further to pay than the stewards. This brings a total of $340, and allowing the extravagant sum of $60 for waiters, etc., the grand result is $400 for a sixty days' journey. This estimate is put at top figures, so that there shall be nothing ridiculous in its appearance ; but your readers may rest perfectly satisfied that a trip to Paris, properly managed, and an absence from home of sixty days need not cost any single individual more than $340.—*Cor. Providence Journal.*

THE MICROPHONE.

A paper lately read before the Royal Society announces the invention by Prof. Hughes of this astonishing instrument or apparatus, which opens to our ears a universe of sounds hitherto inaudible—just as the microscope revealed a world of minute life and structure unknown before. Like Mr. Edison, Prof Hughes was one day employing the telephone for various acoustic experiments. He wished to investigate the effect of sonorous vibrations upon the electrical behavior of conductors, led to this idea by the way in which selenium is known to become electrically affected by light, and also by the researches of Sir William Thompson upon the electrical conduct of strained wires. The Professor had a stretched wire on his telephonic circuit, and, though he talked and plucked at it, no effect followed until it broke. At that moment the telephone uttered a sort of "shh," which was very curious. He placed the broken ends together under a weight, and obtained again faint sounds, which were improved when the wires were connected by iron nails, or a steel watch chain—the more pieces and more

diverse in substance from the conductor seemingly the better. Experimenting still further with his broken circuit, especially in the direction of this whisper from Science about "more pieces," he found metallic powder or fine metal filings wonderfully augment the power of transmitting sounds; while shot, in a bright condition, platinum, carbon, and mercury also gave good results, particularly the last. Following up this clew, Prof. Hughes hit upon a plan of suspending finely divided mercury in a stick of charcoal by heating the latter and plunging it into quicksilver, whereupon the charcoal becomes infiltrated with the mercury in minutest but continuous particles Inserting a "transmitter" of this sort in his circuit, an absolutely amazing sensitiveness to sound, as well as power of conveying it with utmost fidelity, was displayed by the apparatus. A touch of the finger on the vibrating plate was conducted to the speaking end in volume of vibration like the rustle of a forest; the stroking of a camel's-hair brush on a card was magnified into the sound of a loud whisper; the beating of a pulse or the tick of a watch was found to pass with perfect clearness through a resistance representing a hundred miles of space; and, when a fly happened to walk over the plate, the tramp of its feet was most distinctly caught, like that of some six-legged horse trotting, and it was, moreover, heard to trumpet from its raised proboscis like an elephant in an India jungle. Sounds, in fact, totally inaudible before to the human ears were arrested and reported by this simple and accidental expedient of interrupting the electrical circuit with a finely divided conducting material. There is almost no doubt that the perfected microphone will convey to us that hidden ripple of the sap rising in growing trees and plants, which Humboldt said might be a continuous melody in the auditory organs of earth's smallest creatures.—*From London Telegraph.*

TREATMENT OF THE APPARENTLY DROWNED.

Dr. Howard, of New York, recently gave a demonstration of his method of treating the apparently drowned, at the Receiving House of the Royal Humane Society at Hyde Park, London. In the treatment recommended by Dr. Howard the patient is stripped to the waist and placed on his stomach, with his clothes or a hard pillow underneath it, so that the stomach and lungs become the highest part of the body. One hand is then placed over the stomach and another on the back, and, by using pressure, any fluid which is in the stomach is ejected. Having got rid of the water the patient is instantly turned upon his back, his clothes or a firm pillow are placed under it, so as to make the pit of the stomach the highest point, and his tongue is drawn out and held at one side of the mouth by a piece of cotton cloth. The arms are next seized at the wrists, drawn backward, and tied across behind the head. After this the operator stands over the patient, and placing his thumbs on the intercostal spaces on either side, proceeds to use pressure, the effect of which is to empty the lungs of a portion of the air contained in them; the hands are suddenly withdrawn, creating a compulsory inspiration. This process is to be carried on till animation is restored.—*Louisville Medical News.*

BOOK REVIEWS.

CURRENT DISCUSSION. A Collection from the Chief English Essays on the Questions of the Times. Edited by Edward L. Burlingame. Vol. II, *Questions of Belief*. N. Y., G. P. Putnam's Sons, 1878. For sale by Matt. Foster & Co., $1.50.

The present volume contains "The Soul and Future Life," by Frederic Harrison, "A Modern Symposium," at which R. H. Hutton, Professor Huxley, Lord Blachford, Hon. Roden Noel, Lord Selborne, W. R. Greg, Rev. Baldwin Brown and Dr. W. G. Ward discuss and pretty effectually demolish Mr. Harrison. Another "Modern Symposium," at which the same gentlemen and one or two other prominent writers and thinkers discuss "The influences upon morality of a decline in religious beliefs;" "The course of Modern thought," by G. H. Lewes. "The Condition and Prospects of the Church of England," by Thomas Hughes, and an essay upon "Is Life Worth Living?" by W. H. Mallock.

All of the above subjects are, as the mere names of the writers assure the reader beforehand, treated ably and comprehensively. For want of space we will only refer to the first essay and the replies to it.

Mr. Harrison, with a great show of fairness and toleration, sets forth the position of the Positivists, who reject all hypotheses and accept nothing which cannot be proven, contemning with equal decisiveness the methods of the Materialists and of those who regard the human soul as an "immaterial entity temporarily indwelling in man's body," and erecting between the two a structure which satisfies neither. To give an idea of his position we quote a few lines:

"By a vast accumulation of proof, positive thought has at last established a distinct correspondence between every process of thought or feeling and some corporeal phenomenon. * * * To positive methods every fact of thinking reveals itself as having functional relations with molecular change. * * * Hence we have established an organic correspondence in all manifestations of human life. To think requires a corresponding adjustment of molecular activity. To feel emotion implies nervous organs of feeling. To will implies vital cerebral hemispheres. Observation, reflection, memory, imagination, judgment, have all been analyzed out, till they stand forth as functions of living organs in given conditions of the organism, that is, in a particular environment. * * * But complex as it is, there is no confusion in this whole when conceived by positive methods. No rational thinker now pretends that imagination *is* simply the vibration of a particular fiber. No man can *explain* volition by purely anatomical study. * * * All the spheres of human life are logically separable, though they are organically inter-dependent. * * * The consensus of the human faculties which *we* call the soul, comprises all sides of human nature according to our homogeneous theory."

Thus repudiating at once materialism and faith, and discarding the exploded errors of materialists and spiritualists (meaning, we suppose, those "that have not

seen and yet have believed"), he asserts that the spiritual functions of the soul are positive phenomena, and better satisfied by philosophic and historic answers than by "naked figments." This is as near as we can find out what Mr. Harrison regards as the soul, and we are almost as much in the dark as to his views of the future life. He regards it as selfishness to strive on this earth for Heaven, just for our own gratification and happiness there, and thinks that to so live that there will remain behind us a "permanence of the activities which give others happiness," is better than a future life of "ceaseless psalmody."

As we have above suggested, Mr. Harrison is, at the symposium which follows his essay, very severely handled, both by materialists and spiritualists, and it is well worth any man's while to read carefully this whole discussion as well as those which follow.

This "Current Discussion" series is a valuable and important contribution to literature, and the Putnams are to be thanked for bringing it together in so convenient and handsome a shape; albeit a little closer proof-reading would not be amiss.

THE ELEMENTS OF RHETORIC, by James DeMille, M. A. New York, Harper & Brother, 1878. For sale by Matt. Foster & Co. $1.40

No matter how naturally and easily men may write, they require careful training before they obtain the best power of expression. This is the field of Rhetoric and without its effective teachings composition would be monotonous and unattractive; with them it becomes harmonious, attractive in style and therefore more beneficial to the student and general reader. To those who have read Prof. DeMille's lighter works it is unnecessary to say that he has the elements of a teacher of rhetoric fully at his command, and to those who have not, the present work is abundant proof.

It is long since we have seen a work on Rhetoric, which, in skillful handling of the various departments of the subject and completeness as a whole, has so fully satisfied our idea. We have examined it with care and can find nothing essential to such a work, whether for school-boy or teacher, that is omitted, and nothing included which would, in our opinion, be better left out. It is just such a work as nearly all writers for the daily, weekly or monthly press frequently need at hand for reference or, at times, for guidance.

BULLETIN OF THE UNITED STATES GEOLOGICAL AND GEOGRAPHICAL SURVEY of the Territories. Vol. IV, Nos. 1 and 2. Government Printing Office, 1878.

These Bulletins, published by the Interior Department and edited by Prof. F. V. Hayden, Geologist-in-charge, are becoming more and more interesting and are far more useful in their present form than when, as formerly, included with the formal reports and public documents. The above named numbers are full of valuable information to the naturalist, written by some of the most competent observers in the country if not in the world.

LAPARO—ELOTROTOMY. A substitute for the Cæsarean Section, by T. Gaillard Thomas, M. D. New York, Wm. Woods & Co., 1878. pp. 26. Octavo.

COMPARISON OF THE RESULT of the Cæsarean Section and Laparo—Electrotomy in New York. pp. 4. Octavo. D. Appleton & Co., N. Y.

THE INTRA-VENOUS INJECTION OF MILK as a substitute for the transfusion of blood. Illustrated. By T. Gaillard Thomas, M. D. New York, D. Appleton & Co. pp. 20. Octavo.

The above named pamphlets describe and illustrate fully the new and important operations introduced or revived by Professor Thomas of the New York College of Physicians and Surgeons, who has successfully performed both of them several times in New York City, and who, in these monograms, points out clearly their advantages. They should receive a wide circulation in the medical profession.

OUR REVENUE SYSTEM AND THE CIVIL SERVICE—Shall they be Reformed? By Abraham L. Earle, with preface by Prof. W. G. Sumner. pp. 52. 12 mo. For sale by Matt. Foster & Co. 25 cts.

PROTECTION AND REVENUE IN 1877, by Prof. Wm. G. Sumner of Yale College. pp. 38. 12 mo. For sale by Matt. Foster & Co. 25 cts.

FRANCE AND THE UNITED STATES; their present commercial relations considered with reference to a treaty of reciprocity, comprising papers by M. Menier, Leon Chotteau, Parke Godwin and J. S. Moore. 12 mo. pp. 44. For sale by Matt. Foster & Co. 20 cts.

All of the above belong to the series of Economic Monographs published for the New York Free Trade Club by G. P. Putnam's Sons, and are among the strongest and most instructive papers which have ever been published in favor of free trade. Every merchant, manufacturer and producer in the country should read them, and, whether convinced or not, most of them will at least be wiser and better informed than before.

PROCEEDINGS OF THE DAVENPORT (IOWA) ACADEMY OF NATURAL SCIENCES. Vol. III. Part. I. January, 1876 to June, 1877. pp. 148, Octavo. $3.

The Davenport Academy has acquired a national reputation for the enthusiasm and ability of its members, the thoroughness of their work and the remarkable success which has attended their labors. They have, since December, 1867, built up a fine library, a museum probably unequaled in the West, at least in archæological interest, and erected a handsome building commodious enough for both library and museum, besides containing a large lecture and other necessary rooms.

The present volume is handsomely printed and contains some very interesting and valuable papers on archæology, entomology and other departments of natural history. J. Duncan Putnam is the Corresponding Secretary and seems to be one of the leading spirits.

EDITORIAL NOTES.

THE marked feature of the past month to our scientifically inclined citizens was the visit to this city of the Kansas Academy of Science, whose proceedings have been fully reported by Professor Parker in this number of the REVIEW. The meeting was not only interesting in itself, but also cannot fail to have the effect of uniting more closely the scientific interests of Kansas and Missouri. We look forward with pleasant anticipations to the Tenth annual session of the Kansas Academy at Topeka, at which our Association is specially invited to be present.

AT the regular meeting of the Kansas City Academy of Science held at its rooms May 28, Professor Sheffield read a very interesting and instructive paper, upon "The Metric System," which was very well received and freely discussed.

This being the regular annual meeting, an election of officers was held, resulting in the reëlection of all the former incumbents without opposition, except in the case of Dr. Halley, who declined to serve longer as Treasurer, and whose place was filled by Dr. T. J. Eaton. Dr. Eaton was also replaced upon the Executive Committee.

THE Mennonite grass-burning stove is attracting much attention in Kansas and Nebraska and will, undoubtedly, be adopted largely in those portions of the West where wood and coal are scarce.

We also note that some enterprising citizen of Kansas, taking the hint, has invented a machine for compressing grass, weeds, &c., into convenient shape for fuel. If this proves successful it makes little difference whether the coal supply is exhausted in the next thousand years or not, for there will always be an abundant supply of weeds at all events.

WE are indebted to our old friend, Prof. John Kendrick, LL. D., for Cincinnati papers containing full reports of the Social Science Convention, held in that city the third week in May. It was a very interesting session and attended by some of the most intelligent and scientific men of the country, such as Professors Shaler, Wayland, Clark, Eddy, Pierce, Gen. Pope and many others of equal note. The papers read were mainly practical and valuable contributions to the literature of Sociology.

THE death of Prof. Joseph Henry, so long Secretary of the Smithsonian Institute, which occurred on the 13th of May, has been so widely commented upon by the scientific and daily press that nothing remains to be said by us.

His successor, Prof. Spencer F. Baird, has long been Assistant Secretary of the Institute, is in the prime of life and will doubtless conduct its affairs with the same interpretation of Smithson's will which enabled Prof. Henry to give the Smithsonian the world-wide reputation for successfully "increasing and diffusing useful knowledge among men," which it has attained.

THE verdict of the Coroner's Jury in the case of the men killed by the recent mill explosion at Minneapolis, confirms our theory of its cause. They "unanimously believe that the fire was generated between the mill stones, and, bursting into a blaze, ignited the flour dust in the conveyors and dust room, causing both to explode, jarring the dust of the whole mill into the air, which ignited and caused the first great explosion in the Washburn "A" mill; that the flames from the explosion, aided by the wind, were in a flash carried to the upper windows and dust spouts of the Diamond Mill, causing its explosion, which from the same causes was followed by the explosion of the Humboldt Mill, &c."

AMONG the witticisms in the Editor's Table of *Harper's Monthly* one of the best is that which attributes to Carthage, Mo. the headquarters of a Mississippi steamboat company, the joke being rather on the Editor than any-

body else, since Carthage is more than 300 miles from the Mississippi River, among the spurs of the Ozark Mountains.

Another equally as good was perpetrated by the *Christian Union* a few months since in editorially speaking of the Union Pacific R. R. as passing through Washington Territory! How would it do for these gentlemen to consult some modern geography about the "Far West?"

The Kansas City Academy of Science has probably secured a lecture by Dr. Heath, of Wyandotte, Kansas, who has lately returned on a visit from his adopted home in South America, upon "The Antiquities of Peru." This will be a rich treat, as the Doctor was connected with the Orton expedition and has given much attention to the archæology of that country.

ONE of the most remarkable occurrences which has come under our observation lately is the disappearance of a locomotive and tender beneath the quicksands of Kiowa Creek, Colorado.

The circumstances are somewhat as follows; An eastern-bound freight train on the Kansas Pacific road, on the 21st of May, plunged at full speed into the above named creek, the bridge having been washed away by a flood. The current was so strong that loaded cars and iron parts of the locomotive were washed five miles down stream, while the locomotive and tender disappeared altogether and were not found for more than two weeks afterwards, though diligent and constant search was made with long iron rods and otherwise daily. They were finally discovered, it is reported, by means of a magnet, which was carried over the surface of the sand and was finally attracted by the hidden iron. They are fifteen feet below the sand and twenty-five feet down stream below the bridge. Specific gravity accounts for the sinking of the locomotive through the quicksands, but in our judgment the movement down stream can only be accounted for by supposing that the whole mass of sand in the bed of the stream was in motion, like a glacier, and that the combined weight of the sand and the force of the current were sufficient to force this ponderous mass of iron, weighing perhaps 25 tons, the distance of 25 feet from where it fell. It is calculated that water moving at a velocity of 3,600 feet an hour carries fine gravel and when moving at the rate of two miles carries coarse gravel and pebbles. Such being the case, a stream moving with a velocity of not less than five miles an hour in a bed of quicksand would doubtless move the whole mass with almost irresistible force. It must be remembered that nearly all of the time, the year round, the bed of the Kiowa is perfectly dry and that all the water that flows through it except during freshets, passes beneath the surface of the sand, and it is not unreasonable to suppose that the sand may thus be moved *en masse* when suddenly saturated by a swift and powerful stream. Doubtless the formation of the cañons of the plains may be, in part at least, accounted for in this way.

The frost and storms of May 1878 will cause it to be long remembered by agriculturists and meterologists, as well as by those who suffered in different portions of the country from the effects of its numerous tornadoes and cyclones.

WE have received the following named New Exchanges since our last issue, viz:

The *Observatory*, edited by H. M. Christie, M. A., London. England. Devoted to Astronomy.

The *Polytechnic Review*, published in Philadelphia, and which will be fully noticed hereafter.

The *Chronoscope*, edited and published by Colonel Henry Inman, at Larned, Kansas.

The *Western Homestead*, published by W. S. Burke & Co., at Leavenworth, Kansas, made its second appearance the first of this month. It is a handsome folio of 32 pages, devoted to general literature and fully illustrated, It is attractive in appearance and interesting in contents. Price, $2 per annum.

The American Antiquarian, edited by Rev. Stephen D. Peet, Ashtabula, O., Vol. 1. No. 1, octavo, 60 pages. This is a handsome quarterly, devoted to Early American History, Ethnology and Archæology. Its editor Dr. Peet, has long been recognized as one of the best authorities in the country on archæ-

ology, and he will doubtless soon place his periodical high among works of this class. Price, $2.00 per annum.

NOTES ON THE JUNE PERIODICALS.

One of the most interesting articles in *Popular Science Monthly* for June is that upon "The Age of Gymnastics," by Dr. F. L. Oswald, being a glowing description and eulogy of the the physical culture of the Greeks.

CLEMENS HERSCHEL, C. E., concludes in the *Journal of the Franklin Institute*, very valuable paper upon "The Erosive and Abrading Power of Water upon the Sides and Bottoms of rivers." Just at this time the threatening aspect of the Missouri river renders such reading peculiarly appropriate.

Among the many good things in the *Atlantic* for June we think the "Imaginary Dialogue on Decorative Art," between Socrates and Decalcomanias, by John Trowbridge, one of the best. It is aimed at one of the latest follies of the times and is sarcastic without malice and witty without effort.

THE *Library Table* has been increased in size and decreased in price. We regard this one of the best and most reliable critical periodicals in the country, and as such an excellent guide to those building up libraries.

THE *Botanical Gazette* for June '78, contains among other appropriate things, an article by Prof. Broadhead, of Pleasant Hill, Missouri, upon the Distribution of certain plants in Missouri. It is a useful and well edited periodical, and is published at Logansport, Ind. Price, $1.00 per annum.

UNDER the head of "Mining News," the *Engineering and Mining Journal* devotes a chapter in nearly every issue to the progress of the lead and zinc interests in Missouri and Southwestern Kansas. This is a new feature and gives those regions a prominence in the minds of Eastern capitalists which they have not hitherto possessed.

APPLETON'S *Journal* for June has an article by P. D. Hay, upon "South Carolina Relics," and one by H. W. Raymond upon the "Saalburg Ruins," both of which are interesting to scientific readers from the nearness with which they border upon archæology.

The International Review for June contains a very instructive article by Froude upon "Science and Theology, Ancient and Modern." Also a dual one upon "The Bible" of which Phillip Schaff contributes one part, entitled "Egyptology and the Bible," and Rev. Lyman Abbott the other on "The Gospel According to St. John."

Capt. Eads contributes to *Van Nostrand's Engineering Magazine* for June, a very complete and interesting article upon "The Improvement of St. John's River, Florida." Besides its usual quota of technical articles this number contains a full account of "The Obelisks, their Purpose, Proportions, Material and Position."

Judge E. D. Parsons, late of this city, now of Colorado Springs, Colorado, has published an enthusiastic description, in pamphlet shape, of the prairies of Kansas and the beauties and wealth of the Rocky Mountains, entitled, "Rambles in the Great Kansas Valley and Eastern Colorado." It is well written, and, while lavish in its praises of the region he describes, does no more than even-handed justice to them.

THE Smithsonian Institute sends out a circular asking for information of all kinds bearing upon American Archæology, to be used in an exhaustive work upon that subject. Everything will be acceptable, whether reports of explorations, of earthworks, lists of American antiquities in collections or otherwise, or contributions of specimens of aboriginal art. Address, Hon. Spencer F. Baird, Secretary.

The Peterson's have just published one of Mrs. Burnett's earlier novels entitled "*Miss Crespigny.*" While lacking some of the strength of her later works, it is a pleasure to read it on account of its simple, honest, hearty style—one volume, paper, 50 cents.

Pettingill's *Newspaper Directory* for 1878, is a handsome octavo volume, and shows what a large business can be built up in a comparatively short time by tact and industry alone.

OUR readers will please observe that there are two pages extra of reading this month.